Appendix F

Part 4

RESPONSIVENESS SUMMARY FOR OPERABLE UNITS 2 AND 3
LEMON LANE LANDFILL

Comment 1: Apparently only the bypass water is to be treated at ICS. There are many other springs draining the site (despite contentions that ICS is the drainage point for a multi-acre "drainage basin". These include Slaughterhouse, Weimer, and Cascades. Where is the comprehensive drainage basin study that proves this assumption?

Response: Sampling has shown PCB contamination from the Lemon Lane Landfill in the following springs:

- Illinois Central Spring
- Quarry A and B
- Slaughterhouse Spring
- Rinker Spring

The additional water to be treated under EPA's proposed plan includes the Quarry B and Rinker Spring discharges, and overflow from the existing ICS storage tanks. Quarry A spring will not be captured since it is anticipated that the Quarry A Spring will not flow due to changes in surface water drainage and the scheduled sealing of the Illinois Central Spring swallowholes.

Hydrologic investigations at Lemon Lane Landfill have occurred over a long period of time and have involved numerous dye tracing investigations, pump tests, and sampling events. These data are discussed in Westinghouse (1994) *Summary Report – Lemon Lane Landfill Dye Tracer Tests*, Viacom (March 13, 2002) Lemon Lane Landfill Karst Aquifer Test Reports from October-November 2001, and Viacom (April 2003) *Long-Term Groundwater Monitoring Plan for Lemon Lane Landfill.* Subsequent data have been presented at numerous Citizen Information Committee meetings. Figure 10 of the Proposed Plan shows the configuration of the Illinois Central Spring groundwater basin synthesized from all of these data.

Based on the data as a whole, EPA does not dispute the fact that minor and ephemeral connections may exist between ground water in the vicinity of Lemon Lane Landfill and a few small springs in the area. However, EPA is convinced that substantially all of the PCBs releases derived from Lemon Lane Landfill and emergent in karst spring flow occur via the Illinois Central Spring flow system and its discharge point at Illinois Central Spring. The three springs of the Slaughterhouse Spring Complex appear to have a temporary high-flow connection to Lemon Lane Landfill and transmit a minor PCB discharge. Pursuant to the Long-Term Groundwater Monitoring Plan, Slaughterhouse Spring was sampled during both a low and high flow storm event in October and November 2003. PCBs were detected in low levels in only two of 82 samples collected.

The referenced Weimer springs (WN-1 and WS-2) were among the nine peripheral springs where water samples were collected in 1992 and multiple sediment samples were

collected in 1995. PCBs were not detected in any of 1992 water samples, or in any of the five sediment samples collected at each of these locations in 1995.

The referenced Cascade location was a backup location used for dye trace sampling. It is downstream of Crestmont, Urban, 17th Street, and Pumping Station Springs. No PCBs were detected at any of these springs in multiple 1992 sample events, and no PCBs were detected in five sediment samples collected from Urban and Crestmont in 1995.

The EPA emphasizes, and it should be kept firmly in mind, that tracer detection is not PCB detection. The commenter is reminded that the tracer test results from Lemon Lane Landfill were also reviewed for the Citizens Opposed to PCB Ash (COPA) by Gareth Davies, an independent karst consultant and ground water tracing expert. Mr. Davies concluded that:

> *"From a combination of geomorphological, contaminant, PCB, hydraulic gradient, and discharge data, it can therefore be hypothesized that the most likely discharge locations for ground water from beneath the landfill are the Illinois Central and Quarry Springs.*
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> *It should be emphasized that the results of the initial tracing experiments performed at the site suggested that the discharge locations for the site were principally Illinois Central Spring and Quarry Springs (McCann and Krothe (1992). The high-flow results suggested dye had migrated to many surface and ground-water locations far beyond these springs.*
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> *There would be no logical reason why ground water would flow to these other distal locations given low gradient, long, and thus inefficient flow paths, rather than use the more efficient pathways to Illinois Central Spring and Quarry Spring, where most of the PCBs are being discharged. The third most efficient pathway based upon hydraulic gradient would be the Slaughterhouse Spring Complex, also a site where PCBs have been detected.*
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> *Based upon the tracing results it is logical to conclude that the springs where both dyes and PCBs were detected are the discharge locations for Lemon Lane Landfill. The detection of dyes elsewhere but without PCBs in most cases suggests that the source of those dyes must be different than the source of the PCBs."*

Comment 2: Page 4 –Despite contentions that the OU-1 was implemented, little evidence shows that it was effective. The contention that removal of the source was impossible; a strong effort to actually penetrate the sourcing zones has never been attempted. Even when found, no attempt to 'suck out' the pollution was not implemented. In spite of the Viacom attempt to hit the primary conduit, evidence exists that, in addition to the SE corner, other areas are loaded with PCBs and are amenable to removal. Why not? Most of the effort to characterize the site by wells has been done at the periphery,

not the essential area. Penetrating the RCRA cover with 6" holes will not damage the overall protection. Little justification is presented to justify any technical implacability waivers.

Response: EPA disagrees with the commenter. CBS has spent over 7 years working on trying to find the main conduit and pump PCB contaminated water from the southeastern part of the site. The original shallow bedrock well LF-6 had accumulations of DNAPL and was bailed on several occasions to remove the free product. During the source removal, a pit 30 feet deep into rock was excavated to the 840 elevation around LF-6 and LF-7, and many of the excavated grids in this area extended to bedrock. PCB staining on the bedding plane partings of the rock excavated was noted. In a clay-shale layer at the 840' elevation free product had accumulated and stained the rock. Nowhere else in the landfill area were these conditions so extreme.

Prior to and subsequent to the excavation numerous borings into the underlying rock in the southeast corner of the landfill were made and showed high levels of PCBs in the groundwater, indicative of DNAPL. These results were obtained from water samples from the elevation 850-852' range in LF-1, the 840-848' elevation range in the various LF-6 and 7 borings and in PZ-E, and in the 810-820' elevation range in PZ-F.

Two test wells penetrating the sourcing zones were installed in the southeast corner of the landfill (SE-1 and SE-2) were installed in August 1995. Oil staining with light PCB contamination was observed on rock cores from these holes. Clay recovered at elevation 841.2' at SE-1 had 60 mg/kg PCBs, and confirmed the widespread contamination of clay-shale rock layers at that elevation. A deeper clay layer at elevation 832.2' showed 270 mg/kg PCBs. A clay-shale rock layer at elevation 827.3' had 250 mg/kg PCBs. Even at depths of 52.8' and 66.0' (elevations 819.7' and 806.5' respectively) there was still 11 mg/kg of PCBs found in the clay layers. In SE-2 the clay at depth 53.15-53.25' (elevation 820.25') had 26 mg/kg of PCBs.

Groundwater encountered in SE-1 and SE-2 also had high levels of PCBs (up to 9,700 ug/L). These results clearly show that high levels of PCB contamination reside in the bedrock in the southeast corner of the landfill to a depth of at least 70 feet below the ground surface. The development of these wells in August 2005 is believed have contributed to supplying PCBs to Illinois Central Spring at 1,600 ug/L concentration during a storm resulting from Hurricane Katrina. This is the highest PCB concentration ever recorded, and occurred despite active groundwater removal during a pump test conducted during the storm to test the feasibility of removing PCB via these wells. These pump tests suffered from the same difficulty that has plagued all well recovery tests at Lemon Lane Landfill. That is, wells have not been shown to be effective at controlling or intercepting PCBs migrating in groundwater away from the landfill. This leads EPA to the conclusion that well recovery of PCBs in the deep bedrock is an impracticable solution, based on the current state of knowledge and timelines for completing remedy selection. In EPA's view, the best approach to controlling the PCB releases is to capture the groundwater at the most upstream location where is has been demonstrated that the

groundwater may be effectively recovered. This is at the Illinois Central Spring resurgence.

Penetrating the flexible membrane liner would reduce the effectiveness of the cap and allow leakage into the waste material. Sampling data shows the southeastern portion of the site was the most contaminated area and the commenters statement that evidence exists that other areas are loaded with PCBs is incorrect. The large amount of PCB oil at depth in the bedrock justifies a Technical Impracticability waiver with respect to ARARs that would otherwise apply to water that will be treated by the bypass treatment system.

Comment 3: Page 5 – A suggestion that the ST. Louis/ Harrodsburg contact is the basal resistant for further penetration ignores that this contact dips SW to the Illinois Basin. Whether it slows deeper penetration it does not inhibit the lateral transport in the subsurface. How is this taken into consideration?

Response: EPA believes that groundwater flow in the karst of the U.S Midcontinent may be conceptually visualized as a patchwork series of independent (although in some cases stacked or overlapping) groundwater basins that drain to discrete underflow spring discharge points. A considerable amount of work has been done successfully mapping such groundwater basins in the karst of Kentucky, and a series of groundwater basin maps have been published. EPA acknowledges that there may be some groundwater recharge to deeper hydrostratigraphic units, but monitoring data for wells completed in the phreatic zone below the spring level nowhere indicates levels of PCB contamination typical of the Illinois Central Spring.

Comment 4: Page 9 – Why are discharged volumes untreated? Also, discharges after settling are considered to be PCB-reduced, but there is little evidence that this is actually so. No mass balance study of the system has been done and presented. The sludge sampling plan was made available at the library, but not a report on results. Claims of 'settling' in the tanks as a treatment method have never been substantiated. Because the tanks are open to the atmosphere, it is quite likely that a large component of this 'treatment' is probably volatilization. The air study near the plant did show significant releases from the facility.

Response: The commenter is incorrect. The two storage tanks have shown evidence of settling of solids. Document number 348, dated March 8, 2006 shows the results of the sampling of sludge at the bottom of the two storage tanks. Concentrations greater than 200 ppm were discovered in the sludge and was disposed of in a TSCA landfill. The commenter is incorrect that significant releases from volatilization have occurred. The air sampling data and the subsequent risk analysis completed at ICS (located in Administrative Record) does not support the commenter conclusion. The commenter is also referred to *Alternative Evaluation Report, Illinois Central Spring Water Treatment Facility* (June 2006), Appendix A.

Comment 5: Page 10 – Although this document considers the Viacom attempt to target a 'source' conduit, have they suggested a better plan to extract the contamination than

waiting for it to exit ICS? Further, groundwater contamination has actually not been addressed. Everything seems to focus on ICS as the total of the water from the site. Actually two other significant components are the waters exiting the site via other springs, and what does not come out of the springs, but is still in the subsurface. The springs act as 'overflows' of the karst, but without a water budget study, we are ignoring the contamination in the subsurface water system.

Response: No better plan to extract the groundwater contamination has been proposed. As noted in the response to Comment 2, field testing well extraction schemes has been unsuccessful in controlling spring discharges. Based on the long history of investigative sampling at Lemon Lane Landfill, EPA does not believe that there are other significant PCB discharges.

EPA does not believe that it is correct to consider Illinois Central Spring as a mere "overflow" of the karst system. As pointed out in the response to Comment 3, PCB concentrations at Illinois Central Spring far exceed those found in the deeper groundwater at the landfill. The spring is the *underflow* discharge of the groundwater basin. The focus on ICS is justified as it is the upstream source of contamination to both human and ecologic receptors utilizing Clear Creek. There are no affected groundwater users at the site.

Comment 6: Page 18 – Risk assessments focusing on cancer are incomplete. Far more serious are the chronic effects of PCBs as endocrine disruptors. Why has this element not been addressed?

Response: The risk assessment addressed potential noncarcinogenic effects of PCBs in addition to evaluating carcinogenic effects of PCBs. Consistent with EPA policy, noncarcinogenic effects were evaluated using an oral reference dose (RfD) identified in accordance with the hierarchy of sources established by EPA. The RfD identified for PCBs (2E-05 milligram per kilogram body weight – day) was referenced to EPA's Integrated Risk Information System (IRIS). IRIS is EPA's most preferred source of toxicity factors for use in human health risk assessments. RfDs are designed to be protective of the general population including sensitive subpopulations and development of RfDs considers the potential for a wide variety of noncarcinogenic health effects including immunological, developmental, and others. Therefore, the risk assessment identified and used a health-protective toxicity factor (the RfD) to evaluate the potential noncarcinogenic health effects (including endocrine effects) of PCBs.

Comment 7: Page 20 – Clear Cr. is not the only drainage that needs addressing. In fact the plan basically and incorrectly concludes to do nothing suggests why ignoring other stretches of Lemon Lane drainage are ignored. For example the stretch from ICS at 3rd street south to the confluence with Clear Cr. has long been ignored. Why?

Response: It is unclear to the EPA why the commenter believes the reach of West Fork Clear Creek from Third Street to the Clear Creek main stem has been ignored. EPA

notes springs in this reach of the channel were sampled repeatedly during dye tracer studies and for PCBs several times in 1995.

Comment 8: What basis is there to the assumption that ICS drains a 300 acre site? There are other springs that radiate all around the landfill. Dye trace studies with injection into karst feature are not definitive. Just because traces are found in ICS does not preclude transport to other areas or drainages. Were they all tested simultaneously and in a mass balance scheme to ensure recovery of all dye injected? It really appears that you have an answer and a re stretching the flimsy data to fit it.

Response: EPA has repeatedly addressed these issues, and similar issues, with the commenter and provided written responses. The basis for the 300 acre drainage basin estimate is dye tracing data from various sources, and this figure is in good agreement with spring flow modeling efforts conducted by Viacom. The groundwater basin boundary is shown in Figure 10. Yes, there are obviously other springs around the landfill that were sampled during dye tracing investigations. Mass balances for dyes have been calculated and previously reported to the commenter. See the response to Comment 1 for an independent review of these issues by COPA.

Comment 9: Page 22 – Where does the figure of 30.5 extra tanks come from? Please justify. Just because the total untreated volume may require 30.5 tanks, that is not the mode of operation. The storage tanks are not for long-term storage, but just as 'load-leveling' devices. Even one additional tank would significantly add to the ability of the 1,000 gpm system to catch up with storm events without releases. A TI waiver is not justified. If it is based on 30.5 tanks, it is specious.

Response: Please refer to the data for the January 3, 2005 storm event as cited on Page 22. EPA developed a spreadsheet model to evaluate PCB capture by the ICS Water Treatment Facility. The model may be used to track storage necessary to totally contain a hydrograph based on a measured, input spring flow hydrograph given any plant processing rate. The plant processing rate was taken to be 1,000 gpm, the current design capacity. For the January 3, 2005 storm the spring flow volume to be held (area under the hydrograph above 1,000 gpm) was 18,311,800 gallons. This may be seen to be equivalent to 30.5 storage tanks by dividing this excess volume by the volume of one of the existing storage tanks (600,000 gallons). EPA disagrees with the commenter on the significance of adding one additional tank. This analysis has previously been performed and is presented in *Alternative Evaluation Report, Illinois Central Spring Water Treatment Facility* (June 2006), Appendix A, and is summarized in Table 2 of the Propose Plan. It is estimated that one additional tank only increases the percentage of water treated from 91.2 to 92.8 percent without changing the treatment capacity.

Comment 10: Deed restrictions at the area behind Hinkle's to restrict residential use are reasonable, but ignores the whole stretch of the properties south of the 3rd street which includes many residential areas. Why?

Response: EPA does not have evidence that the areas referenced are contaminated at levels which require deed restrictions. This area will be reevaluated during the Five-Year Review.

Comment 11: Page 24 – What is 'Estimated Present Worth Cost' and what is its significance in this situation?

Response: EPA guidance requires the use of a present worth calculation to facilitate the comparison of the cost of each alternative. Present worth is defined as the amount of money that would be required now to implement the entire remedy. EPA requires the use of a 7% interest rate. EPA also used a 2% rate of inflation in calculating costs.

Comment 12: Table 6 shows Alternative 3 is so much superior to the present system. Why not switch over to this new and improved technology? At a capacity of 5,000 gpm it certainly can increase system capacity. Of course nothing is presented to technically justify these glowing pluses? Where has the technology been field tested? Actually, direct exposure of activated carbon to sediment loaded water is carbon-killer. For the same reason that the present system takes elaborate steps to filter out solids before passage thro the GAC, shows the need for protecting carbon from sediments. How does the 'new' technology get around that? Table 6 admits this but with no verification of the 3+ mark for 'Reliability of Technology'.

Response: The selected remedy for the storage tank overflow system is not superior to the 1,000 gpm system. The 1,000 gpm treatment system will continue to operate with the 5,000 gpm treatment system. The 5,000 gpm system will be used only a few times per year and will have backwash capability to prevent the buildup of solids trapped in the carbon. The system design was based upon a treatability study completed by Earth Tech and the results are present in the Alternative Evaluation report (document number 357, dated June 2006 in the Administrative Record). In addition, Earth Tech has been in discussion with carbon vendors and discussed the solids loading with them and based upon information to date, filtration will not be needed. If during design phase it is determined that the system will operate more efficiently with some type of filtration, then it will be added.

Comment 13: The whole concept of 'clarification' as a treatment process has never been tested or proven. Please discontinue relying on that step as a viable component. With open tanks, air emissions are part of the reason we might see a reduction in PCB levels in the water. The air testing that was done a few years ago showed significant air releases from the plant. Hopefully the plant operators are knowledgeable about their exposure and are routinely assessed for cumulative threat to their endocrine system.

Response: Clarification is a viable treatment process within the storage tanks. Sampling has shown large concentrations of PCBs at the bottom of the tanks. Please see response to Comment 4. Air monitoring completed for worker safety shows levels 1000 times lower than the Occupational Health and Safety Administration (OSHA) requirements for PCBs.

Comment 14: In Table 6 criteria 4 mentions 'Type & Quantity of (Process) Residuals' provides poor effectiveness for Alternative 3, but superior marks for Alternative 1, i.e., the current system. What does this mean? Are we getting a worse result with the proposed alternative than we have now?

Further the 'ability to monitor effectiveness' is low for Alt 1, but high for #3. What changes in measurement technology cause this difference, and for that matter, the variability over all the alternatives?

Response: Alternative 3 will produce much more solids through the backwashing of the 8 carbon vessels along with the solids produced from the 1,000 gpm system. This will require much more effort to manage compared to the current 1,000 gpm system. The production of additional sludge can be managed with the current system. Alternative 3 treats nearly 100% of the water from ICS and removes approximately 99% of the PCB mass released from ICS. With this amount of water treatment, compared with 91% of water treated and 75% of PCB mass removed for Alternative 1, the monitoring of the effectiveness will be easier since much more water is treated.

Comment 15: Page 27 – Operable Unit 3 seems to 'focus' on Clear Cr. alone. What about the sediments in the stretch south of 3rd St. before joining Clear Cr. It passes through residential areas with children playing in the water (personally observed).

Response: Sediment sampling in the past has not shown PCB contamination. This area will be reevaluated during the Five-Year Review. The human health risk assessment did evaluate children playing in the quarry springs area.

Comment 16: Further, the whole discussion with data that definitely requires attention, and then, a conclusion that nothing to be done. Is that appropriate?

Response: EPA is unsure as to what the commenter is referring to. The sediment sampling and data analysis shows that sediment based upon the surface weighted average is below 1 ppm PCB. EPA is not of the opinion that removing PCBs would greatly change the surface weighted average PCB concentration.

Comment 17: If the cleanup target is 1 ppm, why not remove everything that is above 1 ppm and not manipulate the data with averages of 5 ppm? (And additionally, what is an average with a range? statistically meaningless.) And, again how does the EPA justify a 'no action' decision with such strong evidence of contamination? Is there a reliance on nature to cleanse itself? The sediment is not locked in place. Every storm event moves it> Are we back to the 'solution to pollution is dilution'?

Response: The cleanup target is 1 ppm PCB in sediment and the concept of surface weighted average was used. This concept is used at sediment sites and takes into consideration that fish will see an average concentration over time. In addition, the highest concentrations of PCBs were at depth which would not be available to fish. The

source control cleanup at the landfill and the treatment of contaminated water from the spring system associated with Lemon Lane Landfill are together expected to improve the sediment in Clear Creek over time.

Comment 18: Table 4 indicates that all sediment should be removed, particularly the deeper material. To get at it requires removal of the upper material. Do it all!
Every storm event spreads the contamination further downstream.

Response: Please see the response to Comment 17.

Comment 19: What is a 'non-drainage' area?

Response: A non-drainage area is an area that does not consistently have surface water flow. This term is being used to describe areas that will not become wet during the excavation of soils and sediments at the ICS emergence, swallowhole and quarry springs areas.

Comment 20: Table 5 shows differences in pre-mean concentrations for 12-31" differ ring from Table 4. Why?

Table 5 goals of 5 ppm are unjustified for consideration. First the goal is 1 ppm. Second, to get at the 5 ppm hotspots actually mobilizes contaminated material for transport downstream. Do it all!

And then to conclude that 'no-action' is acceptable is pure mendacity. Why, when your own data says that total removal is needed? And, don't forget the stretch south of 3rd ST before Clear Cr.

Response: Thank you for pointing out the typographical error in Table 4. The 5 ppm goal was used as an example to show the effects of remediating at 5 ppm PCBs. The goal is 1 ppm and using the surface weighted average concentration shows that we are well under the 1 ppm PCB cleanup goal. Our data does not show that total removal is needed. By evaluating the top 6 inches of sediment which is available to fish, EPA is of the opinion that PCB concentrations in fish will not likely improve by removing sediment.

Comment 21: Page 28 – More on Table 6. Why does Alt 1 have a significant reduction of toxicity compared to the marginal acceptability of Alt 3? It would seem that this would be a primary goal of the whole cleanup. Why is it not considered as significant? Again, what makes Alt 3 a 4+ in measuring effectiveness? Won't it be the same technology as used now for Alt 1 (which doesn't meet the state's maximum discharge level for PCBs?) And, again, there is no evidence that Alt 3 is a proven technology. It needs more evidence than a paper explanation. Smacks of 'dry labbing' an experiment.

Response: The commenter is referred to the Alternatives Evaluation document for a discussion on the treatability study. The conceptual design of the 5,000 gpm system was developed using the treatability study and numerous discussions with Calgon (carbon

adsorption vendor). The commenter has misread the Table since Alternative 3 has the most reduction in toxicity. Also, please see response to Comment 14.

Comment 22: Page 30 – The ARARs discussion blithefully dismisses the need for an NPDES permit. What justifies this? Previous explanations that the ICS treatment facility was an 'emergency' response was too glib, but to continue this in the face of discharging a hazardous substance to waters is unconscionable. Why not use a technology that gets to the state's goal and a monitoring method to prove it under an NPDES permit? Because the EPA has the power to get around regulations, does not justify doing so. Greater confidence in the system would be to hold the EPA to its own regs.

Response: The commenter is referred to the CERCLA Section 121 for a discussion on why a permit is not required. EPA still must meet the substantive requirements of the NPDES program but not the administrative requirements. As discussed in the Proposed Plan, the proposed remedy will meet the substantive requirements of the State NPDES program. EPA is meeting the requirements of the law.

Comment 23: How can Indiana DEM accept a 0.3 ppb goal when there is a legal requirement for a much lower limit? Analytical technology does exist to get reliable data. Although it does require some innovations in sample handling, concentration, and instrumentation, it can be done, if there is a will to accomplish it. The TI waiver is a copout. Alt 3 claims significant improvements in managing the storm excesses, yet there is a clear implication that 1,000 plus gpm will still be released. Does this also imply that the current storage tanks will not be used?

Response: IDEM is responsible for developing the NPDES substantive requirements pursuant to their regulations. The 0.3 ppb level is based upon the level of quantitation described in the regulations. Please see Administrative Record document number 355, dated April 13, 2006 for a complete description of the States reasoning for using the 0.3 ppb PCB standard. The use of the TI waiver is not a copout. The 1,000 gpm system and the storage tanks will continue to be used but the selected remedy will treat bypass water from the two storage tanks through a new treatment system capable of handling 5,000 gpm.

Comment 24: Under 329 IAC 4.1 – 4 waste sludge generated by the plant must be appropriately managed. First, does the facility adhere to the 90 day limit on storage before disposal? Because no mass balance study on the removal effectiveness has been done, and exposure of wet sludge to air allows significant volatilization of PCBs, reliance on sludge analyses that permit disposal in a Vigo Co. landfill rather than a hazardous waste landfill are very questionable. If the EPA was scrupulous about protection of human health and ecological systems, there would actually be proof that these systems worked in isolating PCBs rather than wasting money on sham cleanups.

Response: The commenter wrongly assumes that the waste sludge falls under the 90-day storage requirements under Resource Conservation Recovery Act. The sludge is not RCRA characteristic waste which is determined by the toxicity characteristic leaching

potential (TCLP) test or a RCRA listed waste, therefore the 90 day storage requirements would not apply. The commenter makes a claim that significant volatilization of PCBs occurs without providing any evidence. EPA has completed air sampling both inside and outside the building along with worker safety monitoring and significant levels of PCBs were not released to the air. EPA and the State follow all the pertinent regulations for disposal and depending on the PCB concentration in the sludge determines the disposal site.

Comment 25: Page 31 – One of the problems with 326 IAC 2-4.1 is that it specifies tonnages. It doesn't take into account the varying toxicities of the substances. A serious loophole that you are using to promote 'the solution to pollution is dilution'. Unconscionable. PCBs are endocrine disruptors and there is no evidence of a lowest tolerance limit for the impacts.

Response: EPA requests from the State applicable or relevant and appropriate requirements (ARARs) which are the regulations which apply to the remediation. The State does not have any regulations that are applied as the commenter suggests. EPA has not used dilution as a remediation tool. A risk assessment was completed on the air sampling done both inside and outside the ICS water treatment plant and determined that PCB concentrations in the air were within acceptable levels.

Comment 26: The dismissal of the clear evidence of sediment contamination in Clear Cr. that calls for total removal to prevent ongoing damage as the sediment moves downstream is again unjustified and unconscionable. Every storm disturbs the contaminated material and moves it downstream.

Response: EPA disagrees with the commenter that sediment contamination is widespread in Clear Creek. The first 6 inches of sediment have a surface weighted average of less than 1 ppm PCBs.

Comment 27: Page 32 – Alt 3 is not clear about 'multimedia' approach. This needs further clarification and explanation. Simple passage through activated carbon suggests that the current system is somewhat elaborate and over-engineered. However the explanation that the solids need removal before carbon treatment would not be overwhelmed and inactivated still seems reasonable. What component in the 'new' technology of Alt 3 avoids the need to remove solids?

Response: Please see Response to Comment 12.

Comment 28: Since PCBs were first detected leaving the Lemon Lane Landfill the general public of Bloomington has been pleading to collect and treat all water leaving Lemon Lane. EPA's building of the Illinois Central Water Treatment facility has greatly reduced the amount of PCBs escaping into the environment.

COPA also agrees that the "hot spot" excavation at Lemon Lane also greatly reduce the total volume of PCBs at the site. Although EPA readily admits that it was virtually

impossible to do a 100% total excavation of PCBs due to the fact the PCBs have migrated below bedrock at the site, all subsequent testing by EPA and CBS strengthen the position that additional excavation and water treatment are necessary. Not only has further testing by CBS demonstrated that there are still heavily contaminated areas within Lemon Lane, like along and under the rail road tracks adjacent to the site, the testing has also proven that understanding the geology under and surrounding the site is limited at best. (See Attached Davies comments)

Response: EPA agrees with the commenter that additional water treatment is required. Regarding the additional excavation, CBS may continue to investigate the southeast portion of the site to determine if operation and maintenance costs at the water treatment plant over time can be reduced. The difficulty in doing further excavation of rock at depths of up to 70 feet lead EPA to focus on expanding the water treatment plant to address the continuing release of PCBs.

Comment 29: The continued release of PCBs from the site, the less than 100% effectiveness of the Illinois Central Sprint Water Treatment facility, the less than exact understanding of the karst geology beneath the site, and the fact that Lemon Lane contains significant amounts of PCbs, all support EPA selected remedy of additional excavation, increase capacity of treating all the water and continual monitoring of the site.

The water treatment facility has a proven track record of effectively treating 80% of water released from the site. The facility has a proven track record of operating effectively and all testing by EPA and CBS at Lemon Lane support the need for the treatment facility to be expanded. Even the total cost of the proposed remedy is low compared to all the expense incurred by all parties in trying to understand the site better.

CBS argues there is no risk and EPA argues there is sufficient risk to address. Both EPA and CBS will have supporting documentation to support their side of the debate but even the most optimistic conclusion related to risk would acknowledge the fact that PCBs are not a good thing to continually be released into an environment where people fish, play, or live. The proposed remedy addresses the environmental risks with a proven method of treatment at a reasonable cost.

The cost to the Bloomington community debating the risk of continued releases for over 20 years is beyond calculation. The delay by CBS in wanting to easily eliminate the risk from future releases is mind boggling to say the least. The patience of the government parties over the last six years in continual testing by CBS, and the continual delay of addressing the releases is also difficult to understand.

So now after 20 years of debate on how to deal with Lemon Lane, after 20 additional years of releases from the site, after millions of dollars have been spent by all parties in better understanding the site how could this proposed remedy not be completed.

It would be false to assume COPA or the majority of the Bloomington community would not favor total excavation of the site if it were physically possible or financially acceptable to all parties, especially CBS which has a proven record of spending money to block doing anything when the same amount of money would satisfy most of the general public and all the governmental parties.

Years and yeas of debate and testing, monitoring, drilling, excavating at Lemon Lane has proven one thing for sure, there is still significant PCBs at the site and escaping from the site and the public should not accept this to continue any longer than it already has.

The proposed EPA selected remedial actions should be implemented as soon as possible. And continual monitoring at the site and at the treatment facility should continue until all water leaving the site is tested to contain below acceptable limits of PCBs.

Response: EPA agrees and is working diligently toward a resolution of all these issues.

Comment 30: Page 4: Site Characteristics - Borings and wells have a very low probability of intersecting conduits and there is no mention of this. Also, using borings and wells implicitly assumes that a site is a porous medium. This clearly not the case in carbonates and/or karst, so the data collected from these devices must be treated skeptically until tested using methods that do not make porous medium assumptions.

Response: EPA agrees with these statements. As the commenter is aware, many of the referenced borings and wells were installed to evaluate recovery of PCBs directly at the landfill, a proposition the EPA knows the commenter has been skeptical of since 2000.

Comment 31: Page 5. Site Geology Worthington et al., (2001) show that it is likely that > 99% of the flow is in conduits in karst terrains in Paleozoic rocks. Even in any type of carbonate probably > 94% of the flow is in conduits. Rather than say flow is in karst features the word conduit should be used. If a spring exists then there must be a conduit that the water is discharging from conduits are continuous from sinkholes (swallow holes or swallets) and springs. The term "solution cavities" is used and implies an isolated opening not connected to a conduit. So, if there is solution (or dissolution) it implies that the aquifer is exposed to atmospheric water - which would have initial very high aggressiveness. The question would be how would this water enter a piece of solid rock and initiate the dissolution process if "cavities" formed? The cavity concept possibly comes from the fact that sinuous conduits are sometimes intersected when drilling wells. The term 'solution cavity" is misleading and should not be used.

Response: EPA is aware of the cited literature, and appreciates the commenter's studious views. The referenced section of the document also describes the groundwater flow as through a "branchwork of solution conduits", perhaps a more palatable description for the commenter.

Comment 32: Page 5. Site Hydrogeology - The word majority in terms of low flow and storm water drainage would be much more useful if quantitative tracing had been done

and the actual fraction estimated. The difference between the low and high discharge is > 150 times but still suggests that most of the flow from the basin discharges through ICG Spring.

Response: EPA agrees with the commenter.

Comment 33: Figure 2.The location of Rinker Spring appears to be inaccurate.

Response: Acknowledged. A correct location is shown in Figure 3. For the record, the spring is located approximately 140 feet of the centerline of the ICS water treatment plant entrance road

Comment 34: Page 7. Connection between ICS and Quarry springs area. It appears from the text that this was simply a visual tracer test. I doubt this to be the case - so describe what was done in more detail. It would have been much more useful if a quantitative tracer test had been done to see if there were significant losses to underflow springs. The interpretation of the tracing to Quarry A and Quarry B springs from the swallets needs to be rewritten. It is obvious that there is a lack of knowledge and understanding about the vertical hierarchical nature of flow in carbonates. There are also some logic problems with what is stated about the hydraulic connections in the proposed plan. For example - it cannot be stated that there is no direct connection between ICS and the Quarry B spring because the flows that affect both springs are related by overflow components and the conditions that would allow flow from Lemon Lane Landfill to both springs were not observed and not that they cannot happen. The fact that the Quarry B spring has a reported higher baseflow and comparable PCB data to Quarry A spring suggests that they are related to the same pathways. One is probably discharging more of an overflow component from the baseflow pathway. Another problem is that accurate data on the elevations of the lips of these springs is unknown, but it is clear that they should not be and are not at the same elevations. The fact that Rinker Spring discharges more PCB load is explained by the fact that it is another overflow and the fact that PCB concentrations are often correlated to TSS concentrations and the TSS concentrations should be higher in overflow components because that water may be moving faster especially in storms. Another possibility could be a problem in the tracing data. Rhodamine types dyes were used and they could easily be subject to deaminoalkylation (Käss,1998). This means that one tracer dye can easily look like another. The transformed rhodamine signal may not have been recognized at monitoring locations. This would have been particularly difficult if not almost impossible if the tracing technique used involved charcoal and elutant methods.

Response: The referenced test was a simple visual test conducted by CBS on April 1, 1988. The test was observed by representatives of CBS and EPA. A total of 25 grams of rhodamine WT was injected at Illinois Central Spring at 10:10, and was followed downstream by visual observation. After flowing through a choked railroad culvert, the dye plume front entered the primary ICS swallowhole area at 10:58. The dye was detected at Quarry A at 11:27, and at the Quarry B culvert at 12:00. No dye was observed at Quarry C.

EPA offers additional commentary with respect to the referenced test on Page 7.

"This dye trace established that ICS was not connected directly to Quarry B Spring."

The referenced dye trace was conducted in October 2001. At that time EPA had concerns that PCBs detected at Quarry B were related to direct underflow discharge of groundwater from the Lemon Lane Landfill to the spring. Dyes injected at the landfill had previously been detected at both ICS and Quarry. The ICS discharge entered a swallowhole a short distance downstream from its resurgence, and this swallowhole had also been dye traced to Quarry B. This, the source of the PCBs at Quarry B was unclear. PCBs were always present at Quarry B, even after the ICS Water Treatment Plant began operation and discharge of clean water to the swallowhole. EPA recognized at least two possible explanations for the continued presence of PCBs at Quarry: 1) there is a direct conduit connection between Lemon Lane Landfill and Quarry B existed, or 2) PCBs are being leached from contaminated sediments in the conduit system between the ICS swallowhole and Quarry. The October 2001 dye trace was designed to evaluate whether or not a direct conduit connection existed.

During the October 2001 dye trace the ICS spring water discharge was pumped into the storage tanks and not allowed to enter the primary ICS swallowhole. An additional pump was installed in the surface channel above the swallowholes so the no water entered the ICS swallowholes during the test. Fluorescein dye injected into a shallow monitoring well in the southeast corner of the landfill was appeared at ICS beginning 21 hours after the dye injection. Sampling was conducted at Quarry B for 24 hours after the first dye arrival at ICS. No fluorescein dye was observed above the background level at Quarry B, despite that fact that a massive fluorescein breakthrough curve peaking at over 300 ug/L occurred at ICS. EPA concluded from this test that there was no underflow connection between Lemon Lane Landfill and Quarry B Spring. This is the basis for EPA's comment that ICS is not directly connected to Quarry B Spring.

ICS and Quarry B are both perennial springs, and are both regarded as underflow springs with respect to the cited *vertical hierarchical* nature of flow in karst conduit systems. Quarry B spring appears to receive most of its flow from the ICS swallowholes. Additionally, the spring appears to have a small groundwater drainage basin to the northwest that is independent of ICS groundwater basin.

Comment 35: Page 10. (karst conduit investigation) (The geophysical work done in attempting to identify the location of conduits.) There are several methods that can be used and most are claimed to have marvelous merits. However, there seems to be a lack of understanding that the resolution needed must be at some level and even when this is optimal there may still be noise or uncertainty. It is clear to me that the best initial method in any karst terrain would the Natural Potential method using a base station and a roving electrode. This method allows the resolution of data to be adjusted "on the fly." Following collection of such data other techniques can be used. In my experience the collection of NP or other geophysical data is typically not followed up by enough

drilling. Often only a few test holes are drilled and if these do not result in some obvious feature being seen the NP method is deemed to not work rather than the fact that the drilled hole may have missed the feature possibly by a few centimeters without that being known. What is also problematic is that the geophysicist who did the work is often not consulted sufficiently when the first few holes are drilled to discuss what was observed and where maybe additional holes can be tried. There is a very low probability of drilling to intersect a conduit even if its general location is known. Unfortunately even if conduits can be drilled into the nature of the subsurface often with many interconnected bedding planes down the bore hole above the conduit make sampling for tracers or contaminants subject to complex hydraulic connections that may not result in data that are easy to interpret (Smart, 1999). In addition when tracers are recovered in such conduit wells recovery curves are multimodal and it is very challenging to try and estimate what percentage of the tracer was recovered there. There are also effects that are a result of pumping the well in order to sample the water for the tracers. The same complications can apply to contaminants (Smart, 1999). There are a few examples of collection of geophysical (NP) data followed by drilling and constructing wells with construction of a potentiometric map that shows troughs (and by association conduits) where tracers and contaminants are present.

Response: EPA notes that there has generally been extensive drilling based on the geophysical investigations conducted at Lemon Lane Landfill. Interpretation of conduit locations from potentiometric data has been problematic due to the low hydraulic gradient and the fact that wells used to construct the maps are often completed across multiple dissolution zones. Potentiometric data have consistently shown a low along the east side of the landfill, and some dye tracer tests have indicated that dye moves in that direction. However, as the commenter notes, there is a low probability of intersecting a conduit with a well, and extensive testing of wells in this area has not demonstrated that they are effective in recovering significant quantities of PCBs.

Comment 36: Page 21. Explanation for Figure 10. Somebody please explain "SURFACE WATER SPRING" A spring is the discharge of ground water - which maybe connected to surface water, but is not surface water. So the term "surface water spring" is an oxymoron. It should just be called - spring. Unless there is some chicanery with regards to what type of water the spring is discharging!

Response: EPA recognizes that *karst spring* is perhaps a more appropriate term for the features noted in Figure 10 for a technical audience. EPA developed the Proposed Plan for review by the entire community and *surface water spring* seemed a more appropriate feature description for a non-technical audience. There is no chicanery.

Comment 37: One commenter states that EPA should refrain from describing the Lemon Lane Landfill as a sanitary landfill but was a common dump that became a toxic and hazardous waste dump when Westinghouse dumped thousands of capacitors filled with PCBs at the site from 1958 to 1964.

Response: The Lemon Lane Landfill was operated as a sanitary landfill. Historical records show large amounts of municipal trash were placed in the landfill. The commenter is correct that the landfill became a hazardous waste site when Westinghouse disposed of PCB oil filled capacitors. Other types of hazardous wastes were also disposed of at Lemon Lane. EPA continues to make it clear to the public that hazardous materials have been disposed of in the landfill and that it is on the National Priorities List.

Comment 38: One commenter states that EPA lists the State, City of Bloomington and Monroe County as the governmental parties but continues to hold possible liability over the City for Lemon Lane, therefore forcing the city to agree with everything the EPA wants. The commenter continues that the public has always wanted complete removal but now some city officials are supporting water treatment.

Response: EPA has not held the City of Bloomington hostage as the commenter infers. The City is a co-plaintiff of the United States and the other government parties, and as such, the City been an active player in the discussions to select a remedy that is fully protective of human health and the environment. The City has been a strong supporter of water treatment at the Site because this is the best approach for abating risks posed by PCBs at the Site

Comment 39: One commenter states that after 8 years of global negotiations, EPA and CBS have reached an impasse on EPA's operable units 2 and 3 and water treatment as a final remedy for the PCB superfund NPL list sites.

Response: The commenter is correct that EPA and the other governmental parties have not reached an agreement with CBS on a global settlement but the parties continue to work on resolving our differences. If the parties fail to each an agreement, then a number of enforcement options are available to EPA.

Comment 40: The commenter argues that the proposed ROD Amendment does not comply with the Consent Decree because the Consent Decree called for complete excavation of the Site. Also, the commenter complains that the proposed ROD Amendment does not comply with CERCLA because (1) EPA has considered only cost-effectiveness in selecting the preferred remedial alternative and (2) EPA did not conduct a Remedial Investigation/Feasibility Study.

Response: EPA has put forth remedies that are protective of public health and the environment and has not used only cost effectiveness as the determining factor in decision making. Millions of dollars have been spent addressing the PCB problem in Bloomington. EPA has removed the direct contact threat at the landfill and is addressing risks associated with water and sediment by implementing Alternative 3 and completing a soil/sediment cleanup at the ICS emergence, swallowhole and quarry springs area.

EPA has completed an RI/FS equivalent at the Lemon Lane Landfill. Please see the Lemon Lane Administrative Record. The nature and extent of contamination has been

determined. Further, EPA completed human health and ecological risk assessments and evaluated alternatives to remediate the water and sediment.

Regarding complete excavation, the incinerator was linked in the Consent Decree to complete excavation. EPA reevaluated the site remedy pursuant to the Operating Principles.

Comment 41: One commenter states that EPA tells the public that no alternatives would be considered to hot spot cleanup. In addition, EPA has been arbitrary and capricious by not completing an RI/FS, doing a hot spot excavation as a cleanup and doing water and sediment removal which eliminated the public from the decision making process as if there were no alternatives. The commenter continues with the public feels betrayed by EPA since complete removal was at the heart and soul of the Consent Decree.

Response: The EPA is disappointed that the commenter feels betrayed by the actions of EPA. The Consent Decree did call for complete excavation but also included the construction of an incinerator. EPA has put forth alternative remedies through the EPA's ROD Amendment process and has not been arbitrary and capricious. EPA and CBS have completed an RI/FS equivalent and the Administrative Record clearly shows the large amount of documentation justifying the site remedies. The nature and extent of contamination was determined, both human health and ecological risk assessments were completed and alternatives were evaluated through the use of EPA's nine criteria. The large number of community meetings and the public meeting on the Proposed Plans has not eliminated the public from providing input.

Comment 42: One commenter states that EPA in constructing the 1,000 gpm water treatment plant did not get the plant running prior to the hot spot removal due to leaking storage tanks and did not treat stormwater until August 1, 2001. The commenter continues stating that it is confusing as to who is running and paying for the operation of the ICS plant and why the plant qualified to become a final remedial action after its first three years of operation without a report on it as an act of public accountability.

Response: The commenter is incorrect in stating that the water treatment plant was not operating by the start of the source control remedy. The plant became operational on May 1, 2000. The commenter is correct that the two storage tanks were not operational until after the completion of the source control due to the poor construction of the tanks. The tanks were replaced and were operational by August 1, 2001. Currently, four parties are funding the operation of the ICS water treatment plant and include EPA, State of Indiana, City of Bloomington and CBS. The State is managing the contract but the City of Bloomington is administrating the contract with Environmental Field Services who are running the facility. For historical purposes, the first year of operation was funded by EPA and the next three years were funded by the State of Indiana. If a global settlement is reached with CBS, we would expect CBS to fund the operation and maintenance of the facility. The plant was constructed under EPA's removal authority and a public comment period was not required by the statute. EPA has been open with the public on its operations and will continue to provide the public with monthly progress reports

discussing the operation of the system. The EPA is unsure what the commenter is referring to as to a report on it as an act of public accountability. The plant will be required to meet NPDES substantive requirements and an operation and the maintenance plan will be modified to take into consideration the plant expansion.

Comment 43: One commenter states that water treatment will be the final remedial action for cleanup of the Lemon Lane Landfill by stacking the deck with four alternatives, all concerned with some form of water treatment. In addition, a public hearing has not been held or a report on the performance of the water treatment plant.

Response: EPA has not stacked the deck with the four alternatives. EPA is of the opinion that water treatment is necessary and EPA evaluated a number of different alternatives. EPA did not consider additional source control measures at the landfill due to the large amount of PCBs located up to 70 feet below the top of bedrock over a large area. The difficultly also in trying to pump groundwater at the landfill and the inability to find large pools of PCB oil for pumping leads EPA to focus its efforts on water treatment at ICS. The performance of the water treatment plant is demonstrated in the monthly progress reports submitted by the contractor operating the plant.

Comment 44: One Commenter states that the principal threat wastes were not addressed in operable unit 1 and the definition of principal threat characterizes Monroe County/City of Bloomington and that PCBs in landfills over karst cannot be reliable contained. The commenter would like EPA to consider again complete removal of the PCBs as their scientific consultants recommended 20 years ago.

Response: Principal threat wastes were addressed in the source control remediation. Over 80,000 tons of PCB contaminated material was excavated and the area was verified to a 50 ppm PCB standard on average. EPA is addressing the continuing release of PCBs through water treatment. EPA is not considering complete removal at this time.

Comment 45: One commenter states that Superfund requires long-term remedial actions for NPL sites and PCBs at Lemon Lane should be cleaned up at the source since karst is always evolving and changing.

Response: Long-term monitoring programs will be put in place to address any changes which could occur.

Comment 46: One commenter states that the ICS water treatment plant is an open to the air remedial action. The commenter continues that EPA has ignored the lessons they should have learned during the Lemon Lane excavation and that PCBs are volatile and EPA continues to ignore that fact. In addition, the commenter states the design of the treatment plant is basically deficient with no consideration of the volatility of PCBs under storm conditions.

Response: The commenter has ignored the large amount of air sampling data that was gathered at the ICS water treatment plant. EPA did sample for PCBs in the air at the ICS

plant during a storm event. A risk assessment was completed and showed that the levels were not unacceptable and within the EPA's risk range. The commenter is referred to the Lemon Lane Administrative Record.

Comment 47: One commenter states that EPA continues to TI waiver of the NPDES requirements not be granted for water not treated within the 1,000 gpm system. The commenter continues to state that treating storm events was the principal purpose of the water treatment plant.

Response: The EPA is granting a TI waiver pursuant to Section 121 (d)(4) of CERCLA. As described in the Proposed Plan, EPA will be treating nearly 100% of the water from ICS, (including storm events) but due to the PCB oil being located at depth within the bedrock and the frequent circumstances under which these PCBs are released (namely large infrequent storm events), NPDES discharge criteria will not be given for the storage tank overflow treatment system.

Comment 48: EPA's Decision to Build the ICS Treatment Facility was Not Justified By Any Risk to Human Health or Ecological Receptors

At the time of EPA's 1998 decision to build the ICS Treatment Facility, the most comprehensive analysis of health risks presented by Illinois Central Spring and other springs in the area was contained in the 1996 Health Assessment by the Agency for Toxic Substances and Disease Registry ("ATSDR"). ATSDR considered the potential routes of exposure from the ICS in great detail and concluded "neither children nor adults are likely to engage in activities in the . . . springs and streams that would lead to significant exposures to site-related contaminants."[1] ATSDR also concluded that the PCB levels in fish in Clear Creek were not a health concern because the stream was too small to support fishing for food, and that most of the species close to Lemon Lane Landfill are not considered a human food source.[2]

The ATSDR findings were corroborated by the statements of long time Monroe County fisherman Dan Combs, who was quoted in a 1997 newspaper article, saying that "[n]ot since I was a kid have I seen anyone fishing for food in [Clear Creek]." Mr. Combs further explained: "It just got such a horrid reputation. And what gave it the horrid reputation was the Winston-Thomas raw sewage instead of the PCBs."

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[1] "Public Health Assessment for Bloomington PCB Sites, Bloomington, Monroe County, Indiana and Spencer, Owen County, Indiana" (3 Volumes), prepared by the Division of Health Assessment and Consultation, Agency for Toxic Substances and Disease Registry, Department of Health and Human Services, Public Health Service, Atlanta, Georgia, November 15, 1996 (hereinafter "ATSDR Health Assessment"), Vol. I at 4.

[2] ATSDR Health Assessment at Vol. I., p. 5. EPA did not include the ATSDR Health Assessment in the administrative record, even though it is required to be included by the NCP. 40 C.F.R. § 300.810(a)(1).

S. Hinnefeld, "Health Advisories Cover Many Area Fishing Spots," Bloomington Herald-Times (Aug. 10, 1997). Although the Winston-Thomas plant has been closed, the Dilman Road sewage plant is still operating and discharging into the same area.

Despite this evidence, EPA premised its decision to build the ICS Treatment Facility on the presumed risk to hypothetical fishermen eating a substantial amount of fish on a constant basis from the portion of Clear Creek potentially affected by PCBs from Illinois Central Spring. CBS's letter to EPA of November 10, 1998 (attached as Exhibit A and incorporated by reference) explained in considerable detail why these assumptions were not valid, and those comments are incorporated by reference here. Nonetheless, eight years later, EPA is still using unfounded assumptions about food consumption by hypothetical fishermen to justify the continued operation and expansion of the ICS Treatment Facility. As discussed in greater detail below, EPA's assumptions are totally unrealistic and unsupported by evidence.

Response: CBS comments on both the human health and ecological receptors are addressed later in this Responsiveness Summary. ATSDR's evaluation was completed prior to a large amount of data being gathered and is more of a qualitative analysis and not a quantitative risk assessment. The ATSDR report was prior to EPA doing both a human health and ecological risk assessments. EPA basis its decisions on its risk assessment process and has determined the unacceptable risk is present for both human health and the environment.

Comment 49: The ICS Treatment Facility as Constructed Has Been Largely Ineffective and Overly Expensive

EPA originally projected in its 1998 Action Memorandum that the construction of the ICS Treatment Facility would cost $1.8 million. The actual construction cost exceeded $6.2 million. EPA projected that the ICS Treatment Facility would be operational by the summer of 1999, but EPA did not even begin partial operation until the spring of 2000. The storage tanks were not operational until the summer of 2001.

Even when the ICS Treatment Facility was put in operation, EPA's choice of location made the plant ineffective in capturing PCBs from all springs. More importantly, EPA's poor choice of location resulted in *the discharge of treated water to a contaminated area. Thus, water that is being treated by the ICS Treatment Facility is becoming recontaminated immediately after treatment.* Although CBS advised EPA of concerns about its choice of location, EPA ignored these comments until after the plant was built and put in operation.

Only recently has EPA begun to try to account for these flaws. The "Common Elements" of the four Alternatives discussed in the Proposed Plan includes a modification (Modification B) to relocate the discharge of treated water from the ICS Treatment Facility away from a swallowhole where the water is being recontaminated with PCBs.

Although there has been some reduction in PCB levels in fish in areas closest to the ICS Treatment Facility, PCB levels in fish further down in the main stem of Clear Creek have not been reduced to any significant degree. This evidence suggests that the ICS Treatment Facility has had little impact on PCB levels in fish beyond its immediate vicinity. Although CBS believes that the PCB levels in these fish do not represent a true risk to either humans or ecological receptors, it is clear that the ICS Treatment Facility has been largely ineffective in lowering these levels as EPA had intended in 1998.

Since EPA originally decided to build the ICS Treatment Facility, the cost of the plant has ballooned enormously, going from the estimate of $1.8 million to a true construction cost of over $6 million. EPA has now estimated that continued operation of the ICS Treatment Facility (with two modifications) would cost over $6.8 million on a present value basis. If the additional system described in EPA's preferred option, Alternative 3, is built as well, that net present value cost would mushroom to over $9.1 million. EPA is proposing to throw good money after bad: making extensive capital improvements to an overly expensive, largely ineffective and ultimately unnecessary facility.

Response: The goal of the ICS water treatment plant was to begin operation when CBS began to implement the source control operable unit. EPA did meet those goals when the plant became operational in May 2000. EPA is of the opinion that the plant is in the correct location and if it was placed at the location CBS Corporation requested, uncontaminated water, particularly from Quarry B spring, would have been needlessly treated. By implementing Modification A and B as described in the Alternatives Evaluation, EPA is minimizing the amount of water to be retreated. PCB reductions have occurred in fish and EPA is of the opinion that by expanding the water treatment plant as described in the ROD Amendment and implementing the sediment/soil cleanup, PCB levels in fish should decrease over time. It appears that CBS infers from its comment that additional sources of PCBs are releasing to Clear Creek but CBS has not investigated or shown that other sources exist. Finally, regarding the cost of the ICS water treatment plant, CBS did have the opportunity to construct the water treatment plant, but refused.

Comment 50: EPA's proposed alternatives are all based on the continued operation of the ICS Treatment Facility. As CBS noted at the time when EPA decided to construct the system in 1998, that decision was ill-conceived and inconsistent with CERCLA and the NCP. EPA's original decision to build the ICS Treatment Facility violated the procedural requirements of CERCLA and the NCP, and fundamental principles of administrative law. For example, EPA told the U.S. District Court for the Southern District of Indiana on August 21, 1998 that it had decided to build the ICS Treatment Facility. At the time, EPA had not issued a Record of Decision or Action Memorandum explaining its decision. EPA only issued an Action Memorandum on September 30, 1998 – over a month after it made the decision. The administrative record issued in support of that Action Memorandum included several documents which were generated after EPA had made its announcement on August 21, 1998. Therefore, it is clear that the EPA Action Memorandum is not the true decision document, but a post hoc rationalization of a decision already made outside of the administrative processes required by CERCLA and the NCP. Under traditional principles of administrative law, an agency may not use post

hoc rationalizations to support a previously made decision. *Federal Power Comm. v. Texaco*, 417 U.S. 380, 397 (1974); *Burlington Truck Lines, Inc. v. United States*, 371 U.S. 156, 168-69 (1962); *SEC v. Chenery Corp.*, 332 U.S. 194, 196 (1947).

Response: This comment does not address the relative merits of the cleanup alternatives described in the Lemon Lane Landfill proposed plan for operable units 2 and 3. Instead, this comment is a criticism by the Commenter of events leading up to EPA's decision issue a time-critical removal action memorandum initiating funding of the Illinois Central Spring Water Treatment Plant. Thus, the Commenter's comments on this point do not go to the merits of EPA's proposals for operable units 2 and 3, and are not relevant in deciding the merits of the proposed cleanup alternatives. For completeness, however, EPA addresses the Commenter's arguments regarding alleged procedural problems below.

First, the Commenter claims that EPA did not comply with the procedural requirements of CERCLA and the NCP, because "EPA told the U.S. District Court for the Southern District of Indiana on August 21, 1998 that it had decided to build the ICS Treatment Facility" and, because "EPA only issued an Action Memorandum on September 30, 1998" one month after expressing its intention to the Court. In support of its conclusion that the "Action Memorandum is not the true decision document, but a post hoc rationalization of a decision already made outside of the administrative processes" the commenter cites the fact that the administrative record issued in support of that Action Memorandum included several documents which were generated after EPA had made its announcement on August 21, 1998." The comment demonstrates a misunderstanding of EPA's formal decision making process by duly delegated officials versus the roles EPA and U.S. Department of Justice staff. The fact that EPA and U.S. DOJ may have made representations to the Court regarding an intention to proceed with a removal action does not constitute an Agency decision, because these individuals do not have the authority to commit the needed funding or to make the decisions memorialized in the Action Memorandum. Here, EPA's Superfund Division Director had the delegated authority to select the removal action and to sign the action memorandum committing federal money to do the work. Thus, EPA did not make its decision regarding construction if the Illinois Central Spring water treatment plant, and did not commit funding to pay for the water treatment plant, until the action memorandum was approved and signed by the Superfund Division Director on September 30, 1998. The fact that documents were generated and placed into the Illinois Central Spring administrative record (the administrative record contains the documents supporting the decision made in the Action Memorandum) before the Action Memorandum was signed (but after the August 21, 1998 meeting with the Court) is fully consistent with EPA's CERCLA decision making process and consistent with general principles of administrative law. Indeed, the facts recited by the Commenter demonstrate that the documents were placed into the record before the deciding official, the Superfund Division Director signed the Action memorandum.

Second, the cases cited by the Commenter stand for the proposition that arguments made in court by counsel to try to explain or justify a prior, formal, agency decision may be post hoc rationalizations that do not serve as support for those prior agency decisions. As

explained in a seminal case cite by the Commenter "a reviewing court, in dealing with a determination or judgment which an administrative agency alone is authorized to make, must judge the propriety of such action solely by the grounds invoked by the agency. If those grounds are inadequate or improper, the court is powerless to affirm the administrative action by substituting what it considers to be a more adequate or proper basis." *SEC v. Chenery Corp.*, 332 U.S. 194, 196 (1947). Put another way, an agency decision must be able to stand on its own merits, and later explanations, or attempts to supply new support, cannot be considered in support of a previous agency decision. This is not the fact pattern presented here. Instead, during the August 21, 1998 meeting with the Court, EPA and U.S. DOJ staff may have expressed an intention of how they expected matters to proceed, but the actual decision to fund and construct the Illinois Central Spring water treatment plant was not taken until the Action Memorandum was signed by the decision maker with duly delegated authority. Here, the Action Memorandum is not a no post hoc rationalization of a prior decision. Instead, the Action Memorandum is the decision, made by the individual with the duly delegated authority to take that decision.

Comment 51: EPA never requested public comments on its decision to build the ICS Treatment Facility as a removal action. Under 40 C.F.R. §§ 300.415(n), 300.820, EPA is required, prior to undertaking a removal action, to provide the public – including any known potentially responsible parties (PRPs) – with at least 30 days to submit public comments on the proposed decision. Because EPA decided to select the system as a time-critical removal action, no formal comment period was provided. Nonetheless, CBS made a record of the reasons for its opposition to EPA's decision on November 10, 1998. Under section 113(h) of CERCLA, 42 U.S.C. § 9613(h), however, CBS is precluded from challenging the government's selection of this response action in Court until the government sues CBS to recover its costs, which it has not yet done.

Response: This comment does not address the relative merits of the cleanup alternatives described in the Lemon Lane Landfill proposed plan for operable units 2 and 3. Instead, this comment is a criticism by the commenter of events leading up to EPA's decision issue a time-critical removal action memorandum initiating funding of the Illinois Central Spring Water Treatment Plant. Thus, the comments on this point do not go to the merits of EPA's proposals for operable units 2 and 3, and are not relevant in deciding the merits of the proposed cleanup alternatives. For completeness, however, EPA addresses these arguments regarding alleged procedural problems below.

The Commenter is correct that EPA did not conduct a formal public comment period in connection with its original time-critical removal Action Memorandum. This fact does not establish a procedural defect, however, because under the National Contingency Plan EPA is not required to hold a public comment period before undertaking a time critical removal action and initiating on-site removal activity. Here, based on the facts contained in the administrative record, and based on the determinations contained in the September 30, 1998, Action Memorandum, EPA found it necessary to proceed with the Illinois Central Spring cleanup as a time-critical removal action.

Comment 52: The NCP requires EPA to perform an Engineering Evaluation/Cost Analysis ("EE/CA"), 40 C.F.R. § 300.415(a)(4)(i), if there is a planning period of at least six months, and to submit the EE/CA for public comment. 40 C.F.R. §§ 300.415(n), 300.820. EPA did not prepare an EE/CA.

Response: This comment does not address the relative merits of the cleanup alternatives described in the Lemon Lane Landfill proposed plan for operable units 2 and 3. Instead, this comment is a criticism by the commenter of events leading up to EPA's decision issue a time-critical removal action memorandum initiating funding of the Illinois Central Spring Water Treatment Plant. Thus, the comments on this point do not go to the merits of EPA's proposals for operable units 2 and 3, and are not relevant in deciding the merits of the proposed cleanup alternatives. For completeness, however, EPA addresses these arguments regarding alleged procedural problems below.

The Commenter is correct that where EPA undertakes a non-time critical removal action, EPA is required to prepare an EE/CA and to conduct public comment on the recommendations contained in the EE/CA. Here, however, EPA did not conduct a non-time critical removal and, therefore, no EE/CA was prepared. Instead, EPA followed its time-critical removal process, which does not require preparation of an EE/CA.

Comment 53: Although EPA attempted to justify its decision not to solicit public comments on the ground that this was a "time-critical" removal action, this justification had no merit because EPA had known about the PCBs in Illinois Central Spring since at least 1985, had known about PCBs in the fish in Clear Creek since the 1980s, and was planning to construct the system over a period of more than six months (actual construction took almost two years).

Response: This comment does not address the relative merits of the cleanup alternatives described in the Lemon Lane Landfill proposed plan for operable units 2 and 3. Instead, this comment is a criticism by the commenter of events leading up to EPA's decision issue a time-critical removal action memorandum initiating funding of the Illinois Central Spring Water Treatment Plant. Thus, comments on this point do not go to the merits of EPA's proposals for operable units 2 and 3, and are not relevant in deciding the merits of the proposed cleanup alternatives. For completeness, however, EPA addresses the arguments regarding alleged procedural problems below.

EPA disagrees with the Commenter's conclusion that EPA's decision to proceed with a time-critical removal action was wrong, "because EPA had known about the PCBs in Illinois Central Spring since at least 1985, had known about PCBs in the fish in Clear Creek since the 1980s." The basis for concluding that a time critical removal was necessary are included in the September 30, 1998, time-critical removal Action Memorandum. The fact that EPA may have been aware of some issues regarding the Site for a period of time prior to undertaking the removal action does not take away from the determination that action at the Site became needed on a time-critical basis. Using the Commenter's logic, it would be appropriate to continue to ignore problems the longer those problems are known and the more is understood about those problems. Here, based

on the data developed over time, including storm event data collected starting in 1995, a clearer understanding developed of the nature of the threats posed by the Site, and the time-critical need for action became evident.

Although it may have taken more then six months to complete the design and construction of the removal action after signing the time critical removal Action Memorandum does not take away from the time-critical need to initiate and construct the treatment plant. Instead, this fact is consistent with EPA often conducting time critical removals over a long period of time, depending on the nature of the threats and type of responses required to address the threats.

Comment 54: EPA had no reason to consider its decision to build the ICS Treatment Facility a "removal" action at all. Rather, the construction of this facility was a "stealth" remedial action selected by EPA without regard to the statutory and NCP requirements. CERCLA requires that long term response actions be taken as remedial, not removal measures.

Response: This comment does not address the relative merits of the cleanup alternatives described in the Lemon Lane Landfill proposed plan for operable units 2 and 3. Instead, this comment is a criticism by the Commenter of events leading up to EPA's decision toissue a time-critical removal action memorandum initiating funding of the Illinois Central Spring Water Treatment Plant. Thus, comments on this point do not go to the merits of EPA's proposals for operable units 2 and 3, and are not relevant in deciding the merits of the proposed cleanup alternatives. For completeness, however, EPA addresses these arguments regarding alleged procedural problems below.

EPA disagrees with this comment. The reasons why a time critical removal action was needed at the Illinois Central Spring site were spelled out in the September 30, 1998, Action Memorandum. Further, there was nothing "stealthy" about this removal action, and it was not a "stealth" remedial action. Instead, EPA's time critical removal action constituted a response needed to address immediate threats to human health and the environment posed by conditions at the site as determined in the Action Memorandum. The Illinois Central Spring removal action administrative record establishes that CBS was apprised of EPA intentions regarding the Site. Indeed, the September 30, 1998, Action Memo at page 3 even references that "[d]uring a status conference on August 14, 1998, with Magistrate Foster, the parties informed the court that they were deadlocked as to the need for, and the implementation of, an interim water treatment plant at ICS to be put in place pending evaluations concerning a possible permanent water treatment system."

The fact that EPA is now considering making its removal action response measures a part of the final remedial action does not make the original time-critical removal a "stealth" remedial action response. Both CERCLA and the NCP contemplate EPA undertaking removal response actions before undertaking remedial action response activities. Indeed, CERCLA § 104(a)(2) provides that any removal action should, to the extent practicable, contribute to the efficiency of long term remedial action. This is echoed in the NCP at §

300.415(d). The facts presented here are fully consistent with these goals - the Illinois Central Spring water treatment plant, which was built and operated as a time-critical removal action is now considered a central component of the final remedial action response for the Lemon Lane Landfill.

Comment 55: In its 1998 Action Memorandum, EPA obligated over $2 million to be spent over a period of more than one year. In doing so, EPA violated section 104(c)(1) of CERCLA, 42 U.S.C. § 9604(c)(1), which prohibits EPA from obligating more than $2 million or undertaking a removal action for more than one year unless the Agency makes certain specific findings. The Agency did not make the necessary findings, nor could it do so based on the factual record. The statute allows EPA to exceed the $2 million and one year limits if: (1) "response actions are immediately required to prevent, limit or mitigate an emergency," (2) "there is an immediate risk to human health, welfare or the environment," and (3) "such assistance would not otherwise be provided on a timely basis." 42 U.S.C. § 9604(c)(1); *see also* the NCP at 40 C.F.R § 300.415(b)(5).

An additional exception to these limits exists where the removal action is consistent with a selected remedial action. But the Action Memorandum indicates that EPA had not determined to select any remedial action for the ICS at the time.

The EPA Action Memorandum did not support a finding that any of these factors was satisfied. There was no emergency or immediate risk to human health or the environment. Rather, the data at the time did not show any significant exposure. CBS's Letter to EPA of November 10, 1998 (attached as Exhibit A and incorporated by reference) explained that EPA's analysis of risk was erroneous and that there was no emergency which required action. Moreover, CBS's analysis explained that EPA's proposed construction of an ICS Treatment Facility – which required months to years of construction activities – would not be timely.

Response: This comment does not address the relative merits of the cleanup alternatives described in the Lemon Lane Landfill proposed plan for operable units 2 and 3. Instead, this comment is a criticism by the Commenter of events leading up to EPA's decision issue a time-critical removal action memorandum initiating funding of the Illinois Central Spring Water Treatment Plant, as well as continued funding of construction and operation of the treatment plant.. Thus, comments on this point do not go to the merits of EPA's proposals for operable units 2 and 3, and are not relevant in deciding the merits of the proposed cleanup alternatives. For completeness, however, EPA addresses these arguments regarding alleged procedural problems below.

EPA disagrees with these comments. First, EPA's June 22, 1999, "Request for a Ceiling Increase and a CERCLA Removal Action and Consistency Exemption" (along with its March 16, 2000 "addendum" fully complied with providing the facts, explaining why, and determining that a removal action and consistency exemption to the $2 million and 12 month statutory limits were appropriate. The same holds true for the April 5, 2001, "Request for a Ceiling Increase and a CERCLA Removal Action and Consistency Exemptions."

EPA also disagrees with the Commenter's conclusion that although an additional exception to these limits exists where the removal action is consistent with a selected remedial action, EPA's September 30, 1998, Action Memorandum indicates that EPA had not determined to select any remedial action for the ICS. At page 9 of the Action Memorandum, EPA expressly stated that "[c]onsistent with Section 104(b) of CERCLA, 42 U.S.C. § 9604(b), and 40 C.F.R. § 300.415(g), the interim removal activities contemplated in this Action Memorandum shall, to the extent practicable, contribute to the efficient performance of any long-term remedial action with respect to the release or threatened release." EPA's statement in this regard should put the Commenter's complaint to rest.

Comment 56: EPA has Failed to Consider a "No Further Action" Alternative. The Proposed Plan violates the NCP because EPA has failed to consider a "No Further Action" alternative. The least expensive option, Alternative 1, calls for the continued operation of the ICS Treatment Facility on an indefinite basis at an annual cost of $386,000. Moreover, this option would also required that two modifications to the existing plant for an additional capital cost of $968,000. EPA does not consider the option of shutting down the plant. Also, with respect to the sediment operable unit, EPA only considers the option of removal. It does not consider any alternatives, such as no action. In 40 C.F.R § 300.430(e)(6), the NCP requires that in deciding on remedy, EPA must consider a no action or no further action alternative. EPA has plainly not done that in the Proposed Plan.

Response: Operable Unit 1 (treatment of contaminated groundwater releases to surface water)

The commenter misreads the requirements of the NCP in arguing that EPA had a legal duty to consider the alternative of shutting down the treatment plant. While 40 C.F.R. § 300.430(e)(6) states that EPA shall develop a "no action" alternative, it further states that the "no action" alternative may be "no further action if some removal or remedial action has already occurred at the site." Here, EPA has already constructed a water treatment plant at the site. Thus, contrary to the commenter's suggestion, EPA was under no duty under the NCP to consider the alternative of shutting down the treatment plant.

In any event, EPA did evaluate shutting down the plant, along with many other alternatives, in the document titled "Alternative Evaluation: Screening of Remedial Alternatives" issued in June of 2006 ("AE Report"). In that document, EPA screened out the alternative of decommissioning the water treatment plant, finding that the alternative was not protective of human health and the environment and did not meet ARARs. (AE Report, Appendix D)

Finally, CBS is incorrect that EPA did not consider the alternative of maintaining the treatment plant in its current configuration without implementing modifications A & B. In the AE Report issued in June of 2006, EPA specifically considered the "no further action" alternative where "no changes would be made to the existing physical facility." (AE Report at Section 4.5). EPA also developed a cost analysis for this alternative where

EPA determined the net present value of this alternative to be $5.3 million based upon $0 capital costs and $348,000 in annual O&M costs. (AE Report, Appendix C, Table 1-1 to 1-3). EPA nevertheless determined that all remedial actions selected for further review – including the "no further action" alternative -- should be combined with Modifications A (moving the outfall location from the treatment plant) and Modification B (capturing and treating springs downstream from the treatment plant).

EPA based this determination on the fact that treated water discharged from the plant would become recontaminated when it entered into the swallowhole area downstream from the plant unless Modification A and B were implemented. This recontamination problem is evident from the fact that site investigations show that water entering into the swallowhole area has lower concentrations of PCBs than the water emerging from two downstream springs (Quarry A and Quarry B) that are hydrologically connected to the swallowhole area. The AE Report explained:

> *PCB concentrations in water exiting the [treatment plant] . . .are <0.1 ug/L. Yet all spring water emergent at Quarry A and Quarry B always contain PCBs [ranging from .5 to 1ug/L]. The most probable explanation for this is partitioning of PCBs from contaminated sediments to water moving thought (sic.) karst solution conduits between the swallowholes and the springs. Two clear alternatives exist for preventing this recontamination and isolating PCBs within the karst conduit system:*
>
> 1) *Seal the Principal and Bypass Swallowholes to prevent entry of the [treatment plant] discharge*
> 2) *Bypass the [treatment plant] discharge around the Principal and Overflow Swallowholes*
>
> *Rinker Spring has no known hydrologic connection to the swallowholes, yet is always contaminated with PCBs. Collection and treatment of the Rinker Spring water is recommended to avoid contamination of downstream areas.*

(AE Report at p. 4). Thus, to prevent water discharged by the treatment plant from becoming recontaminated with PCBs, EPA determined that all the remedial alternatives, including the "no further action" alternative, should include Modifications A & B.

In any event, an evaluation of the "no further action" alternative proposed by the commenter (i.e., the alternative of making no physical changes to the water treatment plant and not implementing Modifications A and B) shows that it is not the most appropriate remedy for addressing groundwater releases to surface water.
EPA uses nine criteria to evaluate the remedial alternatives against each other to determine the most appropriate remedy for the site. Each alternative is compared to the other to determine the best balance of the nine criteria. EPA believes that the advantage of the commenter's proposed "no further action" alternative in terms of cost "savings" is far outweighed by advantages afforded by the other remedial alternatives reviewed by

EPA in terms of overall protectiveness, long-term (and short-term) effectiveness, and reduction of toxicity and mobility.

1. Overall Protection of Human Health and the Environment

While the treatment plant has been successful in reducing the mass of PCBs released from Illinois Central Spring, the commenter's proposed "no further action" alternative would be the least protective of human health and the environment in comparison to the other alternatives considered by EPA. Unlike Alternatives 2, 3, and 4, the commenter's proposed "no further action" alternative would not increase the amount of PCB mass that the plant currently removes from Illinois Central Spring. Further, unlike all the other alternatives, the commenter's proposed "no further action alternative" would not prevent recontamination of the discharge from the plant. In short, the commenter's proposed "no further action" alternative would allow more PCB mass to enter into Clear Creek than the other alternatives would allow, and hence, it is the least protective of human health and the environment.

2. Compliance with Applicable or Relevant and Appropriate Requirements

Given the Technical Impracticability waiver of certain ARARs relevant to stormwater discharges that will not be treated by the existing 1,000 gpm treatment plant, the commenter's proposed "no further action" alternative would comply with ARARs set forth in the ROD Amendment. More specifically, the plant would comply with 0.3 ppb effluent limit required by ARARs. However, the utility of the plant meeting this discharge criteria would be significantly undermined by the fact that the water discharged by the plant would become recontaminated before it entered into Clear Creek. While the water discharged from the plant will have a concentration below 0.3 ppb at the outfall, the water will become recontaminated when it flows through the swallowhole area and have a concentration of 0.5 to 1 ppb by the time that it flows into Clear Creek. This concentration is well above the discharge limit of .3 ppb identified by the State of Indiana.

3. Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

In comparing the proposed "no further action" alternative to the other alternatives considered by EPA, the "no further action" alternative would be least effective in the long-term because it would allow the greatest amount of mass to flow into Clear Creek over the long-term.

4. Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

In comparing the proposed "no further action" alternative to the other alternatives considered by EPA, the "no further action" alternative would be the less effective than alternatives 2, 3, and 4 in terms of treating PCB flow and mass. While it would as effective as alternative 1 in terms of treating PCB flow and mass that flow *into* the plant, it would less effective than alternative 1 in terms of reducing the mass of PCBs released into Clear Creek.

5. Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

The proposed "no further action" alternative could be implemented immediately since it requires no changes to the existing plant. That said, the remedy would have an adverse impact on the community to the extent that the remedy would fail to address the recontamination problem and would allow releases from the Quarry Springs and Rinker Spring to flow untreated into Clear Creek.

6. Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

The commenter's proposed "no further action" alternative is feasible since it requires no changes to the existing plant.

7. Cost

To calculate the cost for each alternative, a 7% discount rate was used along with a 2% inflation rate. Present worth calculations were completed. The commenter's proposed "no further action" alternative would be less expensive than the other alternatives considered by EPA, although the cost savings is not dramatic. The commenter's proposed alternative has a net present value of $5,304,000. (AE Report, Appendix C, Table 5). By adding Modifications A and B (as proposed by EPA in Alternative 1), the net present value would increase by only $1,547,000 to $6,851,000

8. State/Support Agency Acceptance

The State of Indiana would unlikely support a remedial action, such as the commenter's proposed "no further action" alternative, that would allow on-going releases to Clear Creek in excess of the .3 ppb effluent limit established by the State for PCB discharges into State waters that are not part of the Great Lakes System. Likewise, the City of Bloomington and Monroe County are unlikely to support a remedial action that fails to address the recontamination problem.

9. Community Acceptance

The public comments are addressed in this Responsiveness Summary. A few commenters submitted a large volume of comments not supporting Alternative 3 (the preferred alternative identified by EPA) and recommending a complete excavation remedy. Given that Alternative 3 is more protective of human health and the environment than the commenter's proposed "no further action" alternative, it is certainty that these commenters would not support the commenter's proposed "no further action" alternative.

Operable Unit 2 (sediment contamination)

The commenter argues that, in addition to considering sediment removal in the area of the swallowhole, EPA should also consider a "no action" alternative. EPA disagrees. Under 40 C.F.R. § 300.430(f)(1)(i)(A), an remedial alternative must meet threshold requirements to be eligible for selection. Specifically, the remedial alternative must be protective of human health and the environment and must be in compliance with ARARs. A "no action" alternative meets neither of these threshold criteria. First, concentrations at the ICS emergence, swallowhole and Quarry Springs area are heavily contaminated with PCBs, including areas with concentrations greater than 50 ppm. The human health risk assessment calculated unacceptable risk at the Quarry Springs area. Also, as the commenter stated in other comments, the effluent from the water treatment plant does flow through the swallowhole and Quarry Springs area. By remediating these areas will prevent further migration of PCBs downstream.

Comment 57: The risk estimates that are provided in the HHRA contain unnecessarily high levels of precautionary default assumptions and uncertainty and do not reflect the likely potential for exposure to media at the Site. It appears that, in an effort to ensure that risks at the Site are not underestimated, a number of conservative default assumptions, which are not supported by available data or site-specific characteristics, have been made and have resulted in substantially overestimated Site risks.

The key issues that have contributed to this overestimation include the following:

- Risks due to fish consumption are overestimated due to the fact that fish ingestion rates do not reflect realistic use of the resource by the surrounding population. In addition, while risk estimates are provided for high levels of consumption of

benthic fish species, it is highly unlikely that these fish will be consumed and therefore that these exposures will occur.

- Risks due to surface water contact are overestimated due to the use of exposure point concentrations (EPCs) that are based on maximum surface water concentrations of PCBs measured at three of the reaches. Further, the HHRA uses unrealistically high ingestion and dermal contact rates, and an unreasonably high exposure frequency for certain reaches and activities.

- Risks due to sediment contact are also inflated due to unreasonable high sediment ingestion rates, soil adherence factors, exposed dermal surface areas, and frequency of contact.

- Risks due to soil exposure are overestimated due to unreasonably high soil ingestion rates, dermal surface areas, and frequency of contact.

- Aggregate risk estimates, which have also been provided by combining estimated risks for individual exposure pathways, have not been derived in an appropriate manner. As a result, they are not reflective of likely levels of exposure and do not provide useful information to assist risk managers in making decisions about potential remedial actions to be taken to mitigate potential risks associated with the Site.

Finally, in discussing the limitations of some of the exposure parameters that have been used in the HHRA, CBS has recommended alternative values for those parameters, based on what we believe to be the best science and our understanding of site characteristics. These have then been combined into alternative risk estimates for each pathway. These revised risk estimates indicate that potential risks associated with this Site are likely to be substantially lower than have been estimated in the HHRA.

Response: EPA's responses to each of the comments above regarding particular elements of the HHRA are addressed in the response to specific comments below. However, EPA's responses to several points raised by CBS are presented below.

- EPA agrees that the fish tissue ingestion rates used in the HHRA are overly conservative and do not adequately represent site-specific stream conditions. The revised HHRA calculations will be based on reduced fish tissue ingestion rates that conservatively reflect site-specific stream conditions.

- EPA agrees that individual anglers are not likely to ingest large amounts of benthic fish from Clear Creek. The revised HHRA calculations are based on recalculated fish tissue exposure point concentrations (EPC) based on 90 percent: 10 percent (pelagic fish:benthic fish) ratio.

- EPA acknowledges that the Strain Ridge Road reach of Clear Creek is somewhat less accessible than the Country Club and Fluckmill Road reaches. Therefore, exposure frequencies for surface water exposure at Strain Ridge Road and

sediment and soil exposure in and along lower Clear Creek (as represented by the Strain Ridge Road reach) have been reduced (to 30 days/year for surface water and sediment exposures and 38 days/year for soil exposures).

- EPA acknowledges that the approach used in the HHRA to calculate total (or aggregate) risks and hazards included some double- and triple-counting of potential soil and sediment exposures. Therefore, sediment and soil risks and hazards will be revised to eliminate double- and triple-counting of sediment and soil exposures. Specifically, sediment and soil risks and hazards will be reduced to reflect the assumption of equal amounts of sediment and soil exposures at each location. Also, because the available fish tissue biomass in Clear Creek may only support a small number (as low as one) of anglers, the majority of individuals that are exposed in and along the Quarry Springs area and Clear Creek are not likely to also ingest fish from Clear Creek. Therefore, the revised HHRA calculations include two types of total risks and hazards: (1) totals for all relevant exposure pathways including sediment, soil, surface water, and fish tissue ingestion and (2) totals based only on all relevant sediment, soil, and surface water exposures.

Recalculated pathway-specific and total risks and hazards are summarized in Tables 1 and 2 (See Attachment A), respectively. Also, recalculated pathway-specific exposures, risks, and hazards are documented in Tables A1 through A5 in Attachment A. Reach-specific total risks are greater than or equal to 1E-06 (1 in 1,000,000) but less than 1E-04 (1 in 10,000) in all reaches (Country Club Road – 8E-06; Fluckmill Road – 6E-05; Strain Ridge Road – 9E-05; and Quarry Springs – 2E-05) based on inclusion of fish tissue ingestion. On the other hand, reach-specific total risks are greater than or equal to 1E-06 only at Quarry Springs (8E-06) when fish tissue ingestion is excluded. Recalculated total hazards exceed 1 at Fluckmill Road (hazard = 3.4) and Strain Ridge Road (hazard = 5.0) based on inclusion of fish tissue ingestion and are less than 1 at all locations when fish tissue ingestion is excluded.

EPA has the mandate and authority to address any risks greater than 1E-06 and hazards greater than 1 including total risks and hazards inclusive of risks and hazards associated with fish ingestion that are expected to impact only a very small number of persons. It should be noted that direct contact risks (that is, excluding results associated with fish ingestion) exceed 1E-06 at Quarry Springs (8E-06).

Further, PCBs are present in whole pelagic and benthic fish at concentrations greater than the Ambient Water Quality Criteria – derived fish tissue level of 0.025 part per million (ppm) and in pelagic and benthic fish fillets at concentrations greater than the PCB action level of 0.05 ppm used to trigger Indiana's fish consumption advisories. EPA's decision to require remedial action (including, but not limited to, the halting of direct discharge of contaminated groundwater into Quarry Springs and Clear Creek) is consistent with the National Oil and Hazardous Substances Pollutant Contingency Plan (NCP) (EPA 1990) and EPA Policy.

Comment 58: Fish Consumption - The HHRA has provided eight sets of risk estimates for the fish consumption pathway at each of the three Clear Creek reaches evaluated.

This has been done by using four different fish consumption rates and applying them separately to the consumption of pelagic and benthic species. The four fish consumption rates selected are assumed to be representative of reasonable maximum exposure (RME) and central tendency exposure (CTE) for recreational anglers and low income anglers. In addition, it is assumed that 100 percent of the fish consumed by some of the anglers will be benthic species including white sucker and creek chub. Finally, it is assumed that this level and type of behavior occurs every year for a period of 30 years.

The consumption rates used are not realistic estimates of exposure at this Site and it is highly unlikely that individuals will consume benthic species regularly. As a result, the risk estimates that are presented are not likely to be representative of the actual potential for exposure at the Site.

Response: EPA acknowledges that (1) the fish tissue ingestion rates (ranging from RME subsistence angler to CTE recreational angler) and (2) the assumption that the fish consumed by some receptors would be benthic species as used in the HHRA are overly conservative and do not adequately represent potential exposure at the Site. As discussed in greater detail below with regard to specific points, the HHRA was revised to incorporate two fundamental changes.

First, a single representative revised RME fish tissue ingestion rate was identified for each reach of Clear Creek. The reach-specific fish tissue ingestion rate will be based on (1) the expected fish tissue biomass present in each Clear Creek reach, (2) the fish tissue ingestion rates supported in other Bloomington area streams, and (3) fish tissue ingestion rates discussed in the literature.

Second, the HHRA now assumes that the majority of fish consumed by anglers is made up of pelagic fish, with a smaller percentage made up of benthic fish. An assumed ratio of pelagic to benthic fish consumed by anglers was used to calculate weighted fish tissue exposure point concentrations (EPC).

The HHRA will continue to evaluate exposures, risks, and hazards associated with fish tissue ingestion assuming an exposure duration of 30 years.

Comment 59: Fish Ingestion Rate - The HHRA asserts that both recreational and low-income subsistence anglers regularly use three reaches of Clear Creek (Country Club Road, Fluckmill Road, and Strain Ridge Road) as a source of food fish, and has selected default exposure parameters that would only potentially be relevant for much larger and more productive fisheries. While there is some indication that individuals may occasionally fish these reaches, it is highly unlikely, given their characteristics and the availability of superior fisheries nearby, that these reaches will experience the level of fishing and consumption activity that has been assumed. Even if these reaches are fished with some regularity, the fish consumption rates that have been selected are not well supported by either site-specific characteristics or the body of literature on fish consumption habits.

The HHRA uses four separate fish consumption rates to evaluate potential exposures via fish harvested from Clear Creek. The fish consumption rates and the populations which they are assumed to characterize are the following:

- 15 g/day -average consumption by recreational anglers
- 59 g/day -high end consumption by recreational anglers
- 43 g/day -average consumption by low-income minority consumers
- 110 g/day -high end consumption by low-income minority consumers

These fish consumption rates were selected based on data collected by West et al. (1989, 1993) in two surveys that were conducted of Michigan anglers. Participants in these studies were asked to recall how many fish meals they had consumed during the previous one-week period and to identify the source of each of those fish meals. The fish meals consumed during the one-week period were then extrapolated to estimate potential long-term consumption rates. There are a number of reasons why these fish consumption rate estimates are not likely to be representative of actual consumption from Clear Creek.

First, these fish consumption rates are based on short-term survey data and cannot be used to reliably estimate long-term consumption rates, particularly high end consumption rates, as acknowledged by EPA (1997). Use of short-term data to estimate long-term consumption rates is inappropriate. In its *Exposure Factors Handbook,* EPA (1997) states "percentiles of the distribution of average daily intake reflective of long-term consumption patterns can not in general be estimated using short-term (e.g., one week) data" (EPA, 1997, p. 10-14). This is true for the West et al. data due to the fact that only those respondents who had consumed fish during the previous one-week period were included in the analysis, thereby overlooking those individuals who may have been fish consumers but consumed fish with less frequency than one time per week. This results in a substantial overestimation of high-end consumption rates. Because the resulting fish consumption rates are strongly biased toward more frequent consumers, they should not be used as a basis for long-term consumption estimates for the risk assessment.

Second, the West et al. (1989) consumption rates include a combination of sport-caught and commercially obtained fish. Because there is no commercial fishery on Clear Creek, it is inappropriate to select fish consumption rates that, in part, reflect consumption of commercially caught fish. While EPA attempted to correct for this bias in the West et al. study, it was necessary for it to use a number of assumptions to derive estimates of sport-caught fish consumption alone. As a result, these estimates are highly uncertain and are not representative of sport-caught fish consumption from a single small waterbody.

Finally, use of the West et al. data, which also include fish consumed from the highly productive Great Lakes fisheries, undoubtedly overestimates consumption from a single small stream. EPA's *Exposure Factors Handbook* provides estimates for recreational fish

consumers based on four "Key" studies. One of the "Key" studies was that conducted by Ebert et al. (1993) of Maine's recreational anglers, which specifically looked at consumption from specific types of waterbodies (i.e., all waterbodies combined, river/stream fish only, lake/pond fish only). Based on the analysis of fish consumed from rivers and streams, Ebert et al. reported a median consumption rate of 1.0 g/day and a 95th percentile consumption rate of 12 g/day. These rates represent consumption from multiple Maine rivers and streams statewide, many of which are extremely high quality fisheries. Thus, while they are considerably lower than the estimates used in the EPA's current risk assessment, even these rates still likely overestimate consumption from a small, limited-quality fishery like that being evaluated for this Site.

EPA has acknowledged the importance of considering differing characteristics of waterbodies when selecting fish consumption rates. For example, in its Technical Background Document for the National Sludge Rule (EPA, 2003), EPA considered fish ingestion by recreational anglers who catch and eat fish from affected waterbodies. While EPA considered selection of ingestion dab from all four "Key" studies presented in the 1997 *Exposure Factors Handbook,* it concluded that, because three of the studies (West et al., 1989, 1993; Connelly et al., 1996) included large numbers of individuals who fished the Great Lakes, the Maine data collected by Ebert et al. (1993) provide a more relevant and appropriate basis for evaluating the streams, rivers and ponds under consideration in developing the sludge rule. Thus the Ebert et al. (1993) data were used as the basis for that national regulation that was promulgated in 2003.

EPA's *Estimating Exposures to Dioxin-Like Compounds* (2000a; Part 1, Volume 4 of the EPA's draft dioxin reassessment), also recognized that smaller waterbodies are likely to have limited rates of consumption. In that document, EPA suggested that an alternative approach, which estimated the number of meals that might be consumed from a single small waterbody, might be used instead to estimate consumption from that waterbody. In that approach, it was suggested that 3 meals/year might be consumed on average and that a high-end consumer might eat 10 meals/year. Using an estimated meal size of 150 g, EPA (2000a) derived a central estimate consumption rate of 1.2 g/day and a high- end estimate of 4.1 g/day.

Other studies of river anglers who use a single river fishery indicate that consumption rates of this magnitude are appropriate. ChemRisk (1991) conducted a creel survey of the West Branch Penobscot River, which is a destination landlocked salmon fishery in Maine. Despite the desirability of this fishery and the availability of large and numerous fish there, the 50th percentile consumption rate for individuals who consumed fish that they harvested from the river was 0.5 g/day and the 95th percentile consumption rate was 11 g/day (ChemRisk, 1991). It is reasonable to assume that estimates of consumption from this river, which is a large, targeted, sport-fishing destination, would grossly overestimate consumption from a small stream like Clear Creek.

The HHRA also assumes that Clear Creek is being used by low-income anglers for the purpose of subsistence fishing and has selected fish consumption rates from West et al. (1993) for minority anglers in an urban area. There is, however, no reason to believe

that low-income anglers are using the upper reaches of Clear Creek for subsistence purposes. While there is evidence that a low income population lives near portions of the creek, available fish consumption survey data demonstrate that there is little correlation between income levels and fish consumption rates. Finally, Clear Creek is such a limited fishing resource that it is not likely that any individual who needs to obtain fish for food would choose to fish there, particularly when Lake Monroe, which is a substantially higher quality fishery, is close by and provides better access for fishing.

While it is sometimes assumed, as a conservative measure, that low-income individuals will catch fish to provide the primary source of protein in their diets, there is little support for this assumption. In fact, it appears that income is not a good predictor of fish consumption rates because the available consumption literature indicates that there are no significant differences in fish consumption rates among different income groups (Javitz et at., 1980; West et al., 1989; 1991; Connelly et al., 1990; Anderson and Rice, 1993; Ebert et al., 1993). Wendt (1986) studied the fish consumption habits of low- income families living in New York State to determine the levels of freshwater fish they consumed from New York State waters. For those who reported eating fish, the annual fish consumption rates ranged from one to 96 meals, with a median of 8.5 meals and a mean consumption rate of 17.5 meals per year. If it is assumed that a meal size is 227 g, the reported rates equate to a median of 5.3 g/day, a mean of 11 g/day, and a maximum of 60 g/day. These rates are similar to the rates reported in various surveys of recreational anglers (Connelly et al., 1996; Ebert et al., 1993; 1996), and are substantially lower than the rates currently used in the HHRA.

To evaluate the potential issue of subsistence fishing, Ebert et al. conducted an additional analysis of the Maine angler survey data to determine whether there were any defining socioeconomic factors among the top 10 percent of consumers who responded to the Maine angler survey (ChemRisk, 1996). To do this, the authors compared angling behavior, demographic characteristics and advisory awareness for the top ten percent consumers (high consumers) to the remaining 90 percent of consumers. This comparison was conducted for total consumption (all waterbody types combined) and for river/stream fish consumption. While the high consumers took more fishing trips than the remaining consumers and were more avid ice fishermen than the others, there were no substantive differences between the high consuming and remaining consuming groups as related to educational level, ethnicity, or income level. Analysis of respondent knowledge about advisories indicated that the high consumers were actually better informed about advisories than the remaining anglers. Overall, these authors reported little evidence that anglers with consumption rates at or above the 90^{th} percentile were distinguishable from other consumers by factors other than their consumption rates.

Finally, it should be noted that subsistence fishing requires an enormous amount of fishing effort. The HHRA suggests that 110 g/day is an appropriate consumption rate for subsistence fishing in Clear Creek. This equates to four ounces of fish consumed every day throughout the year. If a subsistence individual had a family of four to feed, it would require that one pound of edible fish be obtained from Clear Creek daily. Given that the edible portion of fish is roughly 30 percent of the whole fish mass, this means that 3

pounds of fish would need to be harvested daily (well over one-half ton of whole fish harvested yearly) from Clear Creek. Given the limited size and productivity of this reach, the harvesting of such an enormous amount of fish would require an unreasonable amount of fishing effort. It is not realistic to assume that an individual who needs to harvest this mass of fish yearly would choose to fish a small fishery like Clear Creek. Instead, that individual, if he or she exists, would fish from a much larger, more productive fishery where it would be possible to harvest greater numbers of larger fish within a much shorter amount of time.

Response: EPA acknowledges that the fish tissue ingestion rates used in the draft HHRA are overly conservative, do not adequately reflect site-specific conditions, and may be more representative of highly productive fisheries.

The draft HHRA assumed the potential for subsistence fishing from Clear Creek. Low-income neighborhoods are present along Clear Creek, particularly near Country Club Road. However, as noted by CBS, there is little direct evidence that low-income individuals will catch a larger amount of fish to provide the primary source of protein in their diet compared to higher income individuals. As a result, potential exposures and subsequent risks must be evaluated for the entire population (regardless of income or education level). Although it is possible that some current individuals or that some future receptor may attempt to engage in subsistence fishing, EPA recognizes that the fish biomass in Clear Creek is not sufficient to support subsistence fishing as defined in the draft HHRA (up to 110 grams per day). The HHRA was revised to eliminate the assumption of subsistence fishing, and only recreational fishing is now evaluated.

As noted above (under the "Fish Consumption" header), the HHRA was revised to incorporate representative reach-specific fish tissue ingestion rates. These revised fish tissue ingestion rates (see the response under the header "Selection of a Fish Consumption Rate") was used in conjunction with fish tissue EPCs weighted by an assumed ratio of pelagic to benthic fish consumed by receptors. The basis for the revised fish tissue ingestions rates is set forth below in response to Comment 60.

Comment 60: Selection of a Fish Consumption Rate - EPA's draft *Estimating Exposures to Dioxin-Like Compounds* suggested that rates in the range of 1 to 4 g/day are appropriate for evaluating single small waterbodies (EPA, 2000a). The lower end of this range is identical to the median river/stream consumption rate reported by Ebert et al. (1993) while the upper end of the range is lower than the 95th percentile reported from that study. The higher upper bound consumption rate in the Ebert et at. (1993) study is to be expected, however, because this rate is based on anglers' long-term consumption of fish from multiple rivers/streams in the State of Maine, including many, high quality, destination fisheries. It is therefore appropriate that lower upper bound fish consumption rates would be more suitable for evaluating fish consumption from single, small, and substantially less productive reaches, like those being evaluated on Clear Creek.

CBS does not believe that it is likely that any individuals are obtaining fish from the Country Club Road reach of Clear Creek so that the actual consumption rates are likely to be zero. As a conservative measure, however, CBS has evaluated potential occasional

consumption from this area by selecting a fish consumption rate of 1 g/day, for both the CTE and RME analyses, to account for any individuals who might consume as much as three 4-ounce meals per year from this area.

It is possible that individuals might occasionally fish the Fluckmill Road and Strain Ridge Road reaches of Clear Creek. Thus, to evaluate the CTE exposures in both of these reaches, CBS has selected a fish consumption rate of 1 g/day, based on the median consumption rate from the Ebert et al. (1993) study of Maine's recreational anglers and the low end of EPA's (2000a) consumption rate range for single small waterbodies. There are, however, some differences between the physical characteristics and productivity of the Fluckmill Road and Strain Ridge Road reaches. While Fluckmill Road is still very shallow, has a more pronounced gradient, and is directly downstream of a sewage treatment discharge point, Strain Ridge Road is somewhat deeper and slower, has a muddy substrate, and consequently has a higher percentage of larger and more desirable fish species. Thus it is likely that sport anglers might fish and consume fish from Strain Ridge Road with greater frequency than they would consume fish from the Fluckmill Road reach. Consequently, CBS has selected different RME fish consumption rates for these reaches. For Fluckmill Road, it has selected a fish consumption rate of 4 g/day, based on the upper end of EPA's (2000a) fish consumption range for small waterbodies. This is roughly equivalent to one 4-ounce meal per month. CBS has selected a more conservative rate of 12 g/day, based on the 95th percentile from the Ebert et al. (1993) study to evaluate RME exposures at Strain Ridge Road. CBS believes that these rates should be more than adequately representative and protective of any fishing and consumption activities that may occur in Clear Creek.

While it is often assumed that subsistence fishing may be occurring, it is rarely the case except where there are substantial populations of individuals (e.g., Native Americans, Inuits) who, because of cultural habits and traditions, consume large quantities of fish. Otherwise, there is little indication that true subsistence populations exist. Instead, those individuals who consume fish at higher-than-average rates are largely defined by their avidity, not their income level. To assume that such individuals exist and use a small, low-quality fishery like that presented by Clear Creek is not reasonable.

EPA (1989) guidance states that the risk assessor should "characterize the populations on or near the site with respect to location relative to the site, activity patterns, and the presence of sensitive subgroups." Then to identify subpopulations of potential concern, risk assessors should review site area information to determine if there are any subpopulations that may be at increased risk, using information about the site, local census data, and information from local public health officials (EPA, 1989). Such approaches have been used for other HHRA's conducted by EPA. For example, EPA evaluated consumption by potentially sensitive subpopulations (Native Americans and Hmong) along the Fox River and Green Bay because there were data to indicate that these groups, which live in proximity to the study area, fish from the site and have consumption habits that differ from those of the general recreational angler population (RETEC, 2002). Such an approach is appropriate when it is known that this type of activity is occurring. However, subsistence consumption was not

evaluated for either the Hudson River or the Housatonic River risk assessments, despite the substantial sires of those fisheries, because there was no indication that such populations existed there. Rather than evaluate potential for subsistence behavior in the Hudson River risk assessment, EPA stated in its uncertainty analysis that "[although there are no known, distinct subpopulations that may be highly exposed, there is some degree of uncertainty as to whether these subpopulations have been adequately addressed in this risk assessment" (EPA, 2000b). For the Housatonic River risk assessment, EPA did not evaluate subsistence fishing, stating that "EPA has made efforts to identify populations that engage in subsistence fishing in both the Massachusetts and Connecticut reaches of the Housatonic River (including discussions with appropriate state personnel)and has found no evidence that a subsistence population exists at this time" (EPA, 2005).

There is no indication that such steps have been taken to ascertain the existence of a subsistence population using Clear Creek. Rather, it appears the existence of this hypothetical population has been presumed without any basis. In the absence of evidence to support the existence of such a subpopulation, subsistence fishing should not be evaluated in the HHRA as its inclusion implies that this activity is occurring. If further research indicates that such a population does exist and does use Clear Creek, it is recommended that EPA collect specific information about their consumption habits for use in an updated risk assessment.

Response: As noted above in the previous item, the HHRA was revised to eliminate consideration of subsistence fishing in Clear Creek. The basis for the revised reach-specific fish tissue ingestion rates are presented below.

Country Club Road

CBS states it "does not believe that it is likely that any individuals are obtaining fish from the Country Club Road reach of Clear Creek." However, CBS does not provide any justification or basis for this statement, and CBS has not conducted a population or biomass study on any reaches of Clear Creek. However, biomass studies have been conducted for other Bloomington area streams, including Stout's Creek (Normandeau 2004) and Richland Creek (Normandeau 2006). Based on a qualitative comparison of the size and flow of the two streams, and the size and type of fish observed, retained, and caught at Country Club Road during sampling efforts, EPA anticipates that the productivity of this reach of Clear Creek is similar to the Acuff Road reach of Stout's Creek. EPA is not suggesting that the Country Club Road reach of Clear Creek is identical to the Acuff Road reach of Stout's Creek, but in the absence of any reliable data on fish populations or biomass present in Clear Creek, the comparison with the Acuff Road reach is justified for HHRA purposes.

For the HHRA for Bennett's Dump, it was demonstrated that the Acuff Road (location BD-2) reach of Stout's Creek has sufficient fish biomass to support one angler at a fish tissue ingestion rate of 3 grams per day (Tetra Tech 2006a). This fish tissue ingestion rate is slightly higher than that proposed by CBS for Lemon Lane (1 gram per day); however, it is within the 1- to 4-gram range indicated for single small waterbodies in

EPA's draft "Estimating Exposures to Dioxin-Like Compounds (EPA 2000), and it represents a little less than a single 4-ounce meal per month. Therefore, for the purposes of the revised HHRA, EPA identified a RME fish ingestion rate of 3 grams per day for Country Club Road.

Fluckmill Road

CBS contends that Fluckmill Road supports fewer large, desirable fish species than Strain Ridge Road because Fluckmill Road is "very shallow, has a more pronounced gradient, and is directly downstream of a sewage treatment discharge point" in contrast to Strain Ridge Road, which CBS describes as "somewhat deeper and slower, [with] a muddy substrate." EPA disagrees with CBS's assessment of the likely productivity of Fluckmill Road. The Fluckmill Road reach of Clear Creek has a variety of habitats that include all four of the combinations of slow, fast, shallow, and deep waters, with numerous snags, root tballs, and boulders and frequent backchannels and meanders. The variety of habitats, along with the number and size of the fish observed, retained, and in some cases sampled at Fluckmill Road supports the conclusion that the Fluckmill Road reach of Clear Creek is more productive than assumed by CBS. In addition, CBS's assumption that the site's location downstream from a sewage treatment plant depresses fish productivity is not supported by any data. Effluent from sewage treatment plants may decrease local concentrations of dissolved oxygen, but this effect is not likely to be significant at Fluckmill Road because the many pools and runs in the creek are separated by broad riffle areas that maintain high oxygen levels in Clear Creek. A review of physico-chemical water quality parameters (including temperature and dissolved oxygen concentration) as measured by CBS contractors during sampling events at Fluckmill Road does not support the CBS assertion that water quality in the reach is negatively affected by the sewage treatment plant (Viacom 2005).

Based on the observed variety of habitats throughout the reach and the size, number, and variety of fish observed in the reach, EPA assumes that the Fluckmill Road reach of Clear Creek is at least as productive as assumed by CBS for the Strain Ridge Road reach. Therefore, for the purposes of the revised HHRA, EPA identified a RME fish ingestion rate of 12 grams per day for Fluckmill Road. As noted by CBS, this ingestion rate is equivalent to the 95th percentile rate from the Ebert and Others (1993) study and is slightly less than the average recreational ingestion rate of 15 grams per day assumed in the draft HHRA (Tetra Tech 2005).

Strain Ridge Road

EPA agrees with CBS that based on stream characteristics (including primarily the slower stream flow), the Strain Ridge Road reach of Clear Creek is likely to support a greater biomass than the Fluckmill Road reach. This conclusion is supported by the number and size of fish observed, retained, and caught from the Strain Ridge Road reach. As a result, it is reasonable to assume that recreational anglers could fish and consume a greater amount of fish from Strain Ridge Road compared to Fluckmill Road. Therefore, for the purposes of the revised HHRA, EPA identified a RME fish ingestion rate of 25 grams per day for Strain Ridge Road. This ingestion rate is roughly equivalent to an average of the

total (pelagic plus benthic) fish tissue ingestion rates assumed for the 5.5- (15.3 grams per day) and the 12.7-mile (30.5 grams per day) locations on Richland Creek as part of the Neal's Landfill HHRA (Tetra Tech 2006b). It should also be noted that this ingestion rate is less than one-half of the RME recreational angler fish tissue ingestion rate (59 grams per day which was calculated as the average of the RME ingestion rates presented in West and Others 1989 and 1993).

Comment 61: Inclusion of Benthic Species - EPA has based a substantial portion of its risk analysis on the assumption that individuals will eat large amounts of suckers and other bottom feeders from Clear Creek. A body of fish survey data from all regions of the U.S. demonstrates, however, that while suckers are commonly caught by anglers, they are rarely consumed. These data include, but are not limited to, the following:

- The Maine angler survey conducted by Ebert et al (1993), collected catch and harvest data for a one-year period. An analysis of the raw data from that year-long study of 1,612 anglers, who consumed fish, indicates that a total of 20,046 fish were consumed from rivers and streams in the state. Of those, 100 fish (0.5 percent) were bottom fish, which included suckers, carp and sturgeon. These bottom fish were consumed by a total of 7 individuals (0.4% of the surveyed population).

- The West et al, study (1989), upon which EPA has based its fish consumption rates, indicated that only 0.8 percent of total meals consumed consisted of "bottom feeders and suckers."

- The Alabama Department of Environmental Management study of fish consumption by Alabama anglers (ADEM, 1994) also provided information on the species harvested by anglers during a one-year survey. According to information contained in Table 7 of that report, a total of 2,579 fish were harvested by 1,586 anglers during the study period. These fish totaled 3,117 kg of total fish weight. Only one of these fish, with a total weight of 0.36 kg or 0.01 percent of the fish mass harvested, was a sucker.

- The New York Department of Health conducted an evaluation of the fishing habits of Hudson River anglers. In the survey conducted in 1996, it was reported that only three of the 558 fish harvested from the river (0.5 percent) were suckers (NYDOH, 1999). As there is no species-specific consumption information available in that report, it is not known whether or not any of those fish were consumed by the anglers who harvested them.

- A study of the Savannah River freshwater fishery also indicated that the harvest of suckers by recreational anglers was very low (Turcotte, 1983). It appears that approximately 250 fish were suckers of the 550,282 fish harvested from the freshwater section of the river, based on data provided in Tables 6 and 7 of that report. These represented only 0.045 percent of the total fish harvested from the Savannah River during that survey.

- The Florida Department of Environmental Protection conducted a survey of the fish consumption habits of individuals statewide (Degner et al., 1994). As shown in Table B.1 of that report, none of the 4,675 consumers listed suckers as a species of fish that was consumed.[3]

As is demonstrated with consistency in the above studies, suckers are not typically consumed by the angler population. Thus it is unlikely that the consumptions rates assumed by EPA for suckers would ever be approached.

In light of the preponderance of survey data and information, CBS does not believe that individuals are likely to regularly consume suckers. EPA has acknowledged that "benthic species such as white sucker and creek chub are generally less desirable for consumption compared to game fish" (Tetra Tech, 2005a; p. 41). EPA has stated however, that some anglers may be more opportunistic and thus may ingest a higher proportion of sucker and creek chub if they are readily available. There is no information available in the risk assessment that provides information on the relative availability of pelagic vs. benthic species in Clear Creek. However, while opportunistic anglers may consume a combination of species, their consumption will not be limited to a single species. The description of the reaches, which is provided in the HHRA, indicates that pelagic fish are plentiful in those reaches. If this is the case, it is likely that anglers will target those species and will consume few, if any, suckers and chubs. Thus the consumption rates for suckers and chubs are not reasonable, given site-specific conditions.

Response: EPA recognizes that anglers are unlikely to regularly consume a large percentage of benthic fish from Clear Creek. While anglers are more likely to consume pelagic fish (for example, sunfish and bass), a variety of large (> 200 grams) benthic fish were observed and retained during Clear Creek fish sampling events, especially at the Fluckmill and Strain Ridge Road reaches. Therefore, it is not reasonable for CBS to assume that anglers will not catch or consume benthic fish from Clear Creek.

In the absence of data from a stream-specific population survey, for the purposes of the revised HHRA calculations, EPA has used the 90 percent:10 percent (pelagic:benthic) ratio as proposed by CBS to calculate weighted reach-specific fish tissue EPCs. The revised fish tissue EPCs was be used in conjunction with the revised reach-specific fish tissue ingestion rates to calculate revised fish tissue exposures.

Comment 62: Exposure Duration - EPA has used an exposure duration of 30 years for all locations evaluated on Clear Creek. While it is conceivable that an individual could fish Clear Creek every year for 30 years, it is highly unlikely that this would occur, particularly with the regularity that is assumed in the HHRA. Instead, an individual who regularly fishes from year to year is likely to be an avid sport angler who will visit higher quality fisheries during regular fishing trips. Thus this assumption, when combined with

[3] While 17 individuals indicated that they consumed "other freshwater" fish that were not included in the list of species, a review of Table A.6 of that report indicates that suckers were not one of the species reported by survey participants.

the other upper-bound parameters that are used, is highly conservative and likely overstates actual potential for cancer risk.

Response: EPA's use of a 30-year exposure duration is consistent with long-established residential exposure duration under RME conditions. An individual angler may fish a particular stream or a particular stretch of a stream for a variety of different reasons; in fact, these reasons may change during different periods of that angler's life. For example, an angler may fish in a particular stream (for example, Clear Creek) based on its convenient location. Later in life, that same angler may continue to fish in Clear Creek for nostalgic reasons; they have fished there in the past and may consider fishing in Clear Creek to be relaxing and comforting. EPA has never asserted that anglers fish exclusively in Clear Creek. As suggested in CBS's comment, an avid sports angler may fish in higher quality fisheries in addition to Clear Creek. However, EPA maintains that the assumption that an angler may fish in Clear Creek to the extent necessary to meet the assumed fish tissue ingestion rates over a 30-year exposure duration is consistent with RME conditions.

Comment 63: Evaluation of TEQ - EPA has also provided risk estimates for the fish consumption pathway that have been calculated using dioxin toxicity equivalents (TEQ). However, the data used to estimate the TEQ fish tissue concentrations are so limited that they provide little reliable insight into the potential risks associated with dioxin TEQ. For all reaches, only one sample of pelagic fish was analyzed for TEQ. TEQ analysis for benthic species was also extremely limited with analysis of only one sample from Strain Ridge Road, two samples from Country Club Road, and 3 samples from Fluckmill Road. These results cannot be considered representative or reliable without additional sampling to confirm their representation of site-specific tissue concentrations.

In addition, as discussed in previous comments to EPA on the HHRA for the Neal's Landfill Site (Viacom, 2004), there is considerable uncertainty associated with the use of dioxin TEQ to evaluate PCB congeners, including the uncertainties associated with the application of individual toxic equivalence factors, as well as the uncertainty associated with the selection of a cancer slope factor for dioxin. This uncertainty and the scientific validity of the approach are subjects of considerable debate among members of the scientific community and, consequently, are a primary focus of the review of EPA's draft dioxin reassessment, which is currently underway by the National Academy of Sciences (NAS). Until such time as the approach has been deemed to be scientifically valid, results based on the use of this approach should not be used for making risk management decisions.

In addition, the HHRA has reported the results of an evaluation of the noncarcinogenic hazards posed by the "dioxin-like" PCB congeners, using a reference dose of 1 pg/kg-day, based on the value it states was proposed in EPA's draft dioxin reassessment. It should be noted that the EPA has never published a reference dose for dioxin and the draft Dioxin Reassessment does not recommend or propose a reference dose for dioxin or dioxin-like compounds. Therefore, the HHRA erroneously reports the existence of a reference dose that has neither been proposed by EPA nor has its scientific validity been established.

Response: EPA is aware that there is uncertainty associated with use of dioxin toxicity equivalents (TEQ) to evaluate PCB congeners. However, as stated in the HHRA, EPA recognizes that the use of the TEQ methodology as an official policy is still under internal review, and that dioxin toxicity is being reviewed by the NAS. Nonetheless, use of the TEQ methodology "has a sound science basis and is widely applied in peer reviewed published literature" (EPA 2004c). Much of the current debate centers around the compound-specific toxicity equivalency factors (TEF) that should be applied and the uncertainty associated with these TEFs – not the application of the TEQ methodology in general (EPA 2004b). EPA acknowledges that uncertainty is associated with use of the TEQ methodology, but the presence of this uncertainty does not warrant dropping the TEQ methodology entirely (EPA 2004b).

With regard to the dioxin RfD of 1 pg/kg-day used in the HHRA to evaluate hazards associated with potential exposure to dioxin-like PCBs, EPA strongly disagrees with CBS's assertion that EPA has never published a reference dose for dioxin and that the scientific validity of the reference dose used in the HHRA has never been established. EPA proposed an allowable daily intake (ADI) of 1E-06 μg/kg-day (equivalent to 1 pg/kg-day) as part of the Ambient Water Quality Criteria (AWQC) for 2,3,7,8-tetrachloro-dibenzo-p-dioxin (EPA 1984). The ADI is equivalent to an RfD. In addition, the Agency for Toxic Substances and Disease Registry (ATSDR) derived an oral minimum risk level (MRL) of 1 pg/kg-day in the "Toxicological Profile for Chlorinated Dibenzo-p-Dioxins" (ATSDR 1998). Therefore, the scientific validity of the 1 pg/kg-day value has undergone significant peer review. Finally, it is irrelevant that EPA's Dioxin Reassessment (EPA 2003) does not recommend or propose an RfD for dioxins or dioxin-like compounds. It is EPA policy to use previous toxicological values and policies until toxicity factors (including RfDs) are finalized.

Comment 64: Surface Water Contact - The HHRA's analysis of direct contact with surface water from three reaches of Clear Creek and from Quarry Springs indicates that potential risks are well below EPA's acceptable risk range (10^{-4} to 10^{-6}). However, even these risks are substantially overestimated due to the extremely conservative assumptions that have been made in estimating exposures. These unreasonable assumptions include the use of maximum values from six years of surface water monitoring as estimates of the long-term exposure point concentration (EPC) to which individuals will be exposed in the three reaches of Clear Creek. In addition, the risk estimates for the surface water contact pathway are based on unrealistic surface water ingestion rates and extremely unlikely dermal surface areas in most areas of the Creek.

EPCs for Surface Water

Tetra Tech has based its surface water exposure evaluations on the maximum surface water concentration detected in each reach of Clear Creek over six years of sampling. Use of the maximum 6-year concentration as the EPC is inappropriate because long- term repeated exposure with surface water, as is being evaluated in the HHRA, will result in contact with different concentrations over time so that the most appropriate EPC would be a long-term average concentration. Thus, the use a maximum value as the long-term EPC has undoubtedly resulted in overestimated exposures via this pathway.

Response: **CBS** provided to EPA analytical data associated with surface water samples collected in conjunction with fish tissue samples at the Country Club Road, Fluckmill Road, and Strain Ridge Road reaches of Clear Creek (Viacom 2005g). For the years 2000, 2002, and 2004 only a single analytical result was provided at each location; no analytical results were provided for the years 2001, 2003, and 2005. As noted in the risk assessment, the maximum concentration of PCBs remained fairly consistent at each of these three locations based on the available analytical results. It should be noted that in contrast to CBS's statement that "Tetra Tech has based its surface water exposure evaluations on the maximum surface water concentration detected in each reach of Clear Creek," PCBs were detected at a higher concentration (0.026 microgram per liter [μg/L]) than the concentration (0.024 μg/L) used as the exposure point concentration (EPC) at the Strain Ridge Road location.

Use of the maximum surface water concentration for the most recent year for which analytical data were provided is a conservative and health-protective approach. If surface water-related risks or hazards had been shown to be potentially significant (risks greater than or equal to 1E-06 and hazards greater than 1), alternate surface water EPCs would have been investigated. The risk assessment will be revised to acknowledge the conservative nature of the surface water EPCs used in the risk assessment.

Comment 65: Exposure Frequency - The HHRA uses an extremely high exposure frequency of 68 days/year for the surface water exposure pathways. This frequency is based on the assumption that adult and youth recreationalists will spend 4 days per week for 13 weeks, from June through August, and 4 days per month at the Site during April, May, September, and October. There is no indication that this level of recreational activity is occurring along the Creek or would likely occur in the future.

In the Quarry Springs area, where water flow is very minimal and intermittent, it is not likely that individuals involved in recreational activities would wade in the water, and very infrequent that the water would be deep enough that an individual could submerge and thus ingest water. While HHRA recognizes the limited potential for dermal contact, in that it has used a reduced skin surface area (feet only), it does not acknowledge that because the springs are dry or muddy for much of the year, an exposure frequency of 68 days/year is not feasible. Instead, it would be more realistic to assume that an individual might have contact with surface water in this area no more frequently than 5 or 10 days/year.

While it is conceivable that individuals living near Country Club Road reach might visit or play along the Creek on a more regular basis, the more remote nature of the Fluckmill Road and Strain Ridge Road reaches, and substantially more difficult access to them, make it unlikely that individuals will be present in those reaches on a regular basis. Thus, a lower frequency, in the range of 1 day per week during the warmer months of the year, or 30 days/year, is probably more appropriate for these reaches. This exposure frequency was used by EPA to evaluate potential recreational activities in more remote areas of the Housatonic River in Massachusetts (EPA, 2005). CBS believes that an exposure frequency of no more than 30 days per year would be most appropriate and representative of the potential for exposures in these two reaches of the Creek.

Response: EPA is concerned about potential exposures throughout Clear Creek (including the Quarry Springs area) downstream of the site. It is reasonable to expect that area residents may choose to visit and recreate in and along Clear Creek (including the Quarry Springs area) at a nearby location. While other surface water bodies may have a higher overall attractiveness, Clear Creek is the "local" stream and its proximity and a sense of ownership by nearby residents cannot be overlooked. Also, EPA expects that exposure frequency will increase during the summer months, when the heat will make the stream water more attractive. The HHRA is intended to address a RME scenario. That is, not all individuals may be exposed as frequently as assumed, but EPA believes it is reasonable to assume some individuals may be exposed as often as 68 days/year.

Ultimately, all of the water that comes out of the Illinois Central Spring winds up flowing through the Quarry Springs area. Therefore, it is not unreasonable to assume that it is possible to contact contaminated water throughout the year in this area. This is particularly true in the lower reaches between Quarry B and what is referred to as the Quarry Combined culvert – water ponds in this area. EPA recognizes that in the upper reaches near Quarry Springs A, it is possible to find limited to no flow in the fall (September and October). However, if a receptor is intentionally looking for water to recreate in or along, EPA continues to believe that water can be found, especially below Quarry B. The HHRA calculates potential surface water exposures based on the Quarry Springs-combined location, which is located below Quarry B. Therefore, the HHRA will maintain use of an exposure frequency of 68 days/year for the Quarry Springs area. However, the revised HHRA calculations will include a discussion of the fact that this exposure frequency is likely to be somewhat conservative and may overestimate surface water exposures during the fall.

As noted by CBS, an exposure frequency of 68 days/year is reasonable for Country Club Road; therefore, no changes will be made to the exposure frequency value for this location. EPA disagrees with CBS's claim that the Fluckmill Road reach is sufficiently remote and inaccessible to require a reduction in exposure frequency. As noted in Table 2 in the HHRA, both children and adults have been observed fishing from the bridge and railroad structures in the area. Also, the road itself provides access to much of this reach. Therefore, an exposure frequency of 68 days/year will be retained for the Fluckmill Road reach.

EPA acknowledges that the Strain Ridge Road reach is more remote and less accessible than other reaches of Clear Creek. An exposure frequency of 30 days/year as suggested by CBS is more reasonable for this reach. The HHRA will be revised accordingly.

Comment 66: Exposure Time - EPA has used an exposure time of 2 hours/day to evaluate dermal exposure to surface water. This is a greatly inflated estimate of the amount of time that individuals are likely to wade at the Site, particularly when considered in light of the exposure frequency of 68 days/year that is used in the assessment. It is highly unlikely that an individual would spend this amount of time in the water from April through October. This is particularly true for older youths and adults who are not likely to spend substantial amounts of time in the water, even when visiting the Creek.

Given the size and physical nature of the Creek and its low appeal as a recreational location, it seems more reasonable to assume that an individual spends no more than one hour in contact with the surface water during every exposure event. This is the upper bound estimate of the time spent swimming that is recommended by EPA (1997, Table 15-18). Even this assumption would be likely to overestimate potential for exposure through this exposure pathway.

Response: EPA acknowledges that the assumption that individuals are exposed for 2 hours/day on each day of exposure is conservative. Therefore, EPA has revised its exposure time assumption from 2 to 1 hour/day. Exposures, risks, and hazards associated with dermal exposure to surface water will be revised accordingly.

Comment 67: Water Ingestion Rate - EPA has selected a water ingestion rate of 0.0382 L/day for adults and 0.0765 L/day for youths and young children. They have derived these water ingestion rates by using the incidental ingestion of 0.05 L/hour recommended by EPA (1989) for incidental ingestion during swimming, and then assuming the exposure time of 2 hours to derive a total of

0.1 L/day. For youths and young children, they have assumed that individuals will only ingest water during the summer months (13 weeks or 52 visits if there is a visit four days/week) and thus have adjusted the ingestion rate by a factor of 52/68 so that they can combine this ingestion rate with a frequency of 68 days/year to derive a long-term average daily water ingestion rate. EPA has then assumed that adults will ingest water for approximately half of the time that youth receptors will. This approach is unnecessarily convoluted and does not reflect realistic potential for exposure due to this pathway. In addition, it substantially overestimates the amount of time that is spent swimming (0.5 hours/day for central tendency and 1.0 hours per day for upper bound), as described by EPA (1997, Table 15-18).

Ingestion of surface water is only likely to occur if an individual is swimming or is accidentally submerged in surface water. It would be highly unusual for an individual to ingest any surface water while visiting most of the reaches of the Creek evaluated. The Quarry Springs area is intermittent and not likely to be deep enough at any time for an individual to be completely submerged and thus ingest surface water. The Country Club Road and Fluckmill Road reaches are too shallow to provide a good swimming location. Thus individuals at these reaches would only ingest water if they accidentally fell down and swallowed it when they fell. While the Strain Ridge Road reach is somewhat deeper than the other reaches, it is still very unlikely that individuals will be submerged to the extent that they will ingest surface water, except by accident.

As a result, the only occasion that an individual is likely to have an opportunity to ingest water will be if that individual were to fall into a deeper pool and accidentally swallow some water. While this could conceivably occur in some areas, it is not reasonable to assume that this accidental exposure would happen regularly. Instead, it is possible that this type of accidental exposure might occur one or two times per year and that an individual might ingest 50 mL of water during each of those accidental events.

Response: EPA agrees that the approach used to calculate the rate of potential surface water ingestion rate was overly complex. Further, because the methodology assumed exposure during swimming (an activity that was not assumed to occur), this approach did not adequately reflect site-specific conditions.

However, EPA disagrees with CBS's assumption that "ingestion of surface water is only likely to occur if an individual is swimming or is accidentally submerged in surface water." Individuals recreating in or along Clear Creek and Quarry Springs may ingest surface water by scooping water from the creek to their mouth. One fluid ounce of water is equivalent to 29.6 mL. EPA considers one fluid ounce to be a reasonable amount of water to assume an individual ingests to temporarily alleviate a thirst they may have especially on warmer days. EPA also assumes that children and youths may ingest water in this fashion on 50 percent of the days they are assumed to recreate in or along Clear Creek or Quarry Springs. Adults are assumed to ingest water from the creek half as often as children and youths (about 25 percent of the days they are assumed to recreate in or along Clear Creek or Quarry Springs). Therefore, receptor-specific revised surface water ingestion rates are calculated below.

Children and Youths

(0.030 L/day x 0.5) = 0.015 L/day

Adults

(0.030 L/day x 0.25) = 0.0075 L/day

Comment 68: Dermal Surface Area - EPA has assumed that the feet and legs of young children and the feet and lower legs of youths and adults will be in contact with the water for some of the modeled exposure events (except Quarry Springs Area where it is assumed that only the feet are in contact with surface water). These assumptions are plausible for the areas evaluated, given the water depths in those areas.

However, EPA has gone on to assume that individuals are totally submerged in surface water at Country Club Road, Fluckmill Road, and Strain Ridge Road on a regular basis (26 days/year for young children and youths and 5 days/year for adults). CBS asserts that total submersion will not occur in these reaches, where the surface water is very shallow. While total submersion could conceivably occur in some of the slightly deeper pools, it is highly unlikely that anyone would swim there and that accidental submersion would occur more than two times per year.

CBS recommends that total submersion due to swimming in surface water be eliminated in all reaches. Since submersion in deeper pools along Clear Creek could occur a couple of times per year due to accidental falls, it would be appropriate to calculate dermal surface areas using a frequency of 2 days/year combined with the total body surface area, for submersion due to a fall, along with the age-specific surface areas used in the HHRA for wading for the remaining days of exposure that are assumed. For Country Club Road, this results in surface areas of 4,023 cm^2 for adults, 2,870 cm^2 for youths, and 2,207 cm^2

for young children. For the other two reaches, this assumption results in surface areas of 4,565 cm^2 for adults, 3,263 cm^2 for youths, and 2,374 cm^2 for young children.[4]

Response: EPA acknowledges that swimming is unlikely to occur at the Country Club Road, Fluckmill Road, and Strain Ridge Road locations in Clear Creek. However, full body exposure may occur in deeper pools as the result of play or recreational activities (including floating) and accidental falls into the creek. Revised receptor-specific dermal surface areas based on the age-specific surface areas used for total submersion and wading as presented in the risk assessment and the revised location-specific exposure frequencies are presented below.

Child (1 to 6 years)

At Country Club and Fluckmill Roads it is assumed that children (1 to 6 years) have full-body exposure on 25 percent of the available summer days (this equates to 13 days/year), with wading the remainder of available days. Strain Ridge Road is somewhat less desirable as a play or recreational area; therefore, it is assumed that full-body exposure would occur at this location only as the result of accidental submersion (2 days/year), with wading the remainder of available days. Revised receptor-specific dermal surface areas are calculated below:

Country Club and Fluckmill Roads: (6,560 cm^2 x 13/68 days) + (2,075 cm^2 x 55/68 days) = 2,932 cm^2

Strain Ridge Road: (6,560 cm^2 x 2/30 days) + (2,075 cm^2 x 28/30 days) = 2,374 cm^2

Youth (7 to 18 years)

At Country Club and Fluckmill Roads, it is assumed that youths (7 to 18 years) have full-body exposure on 25 percent of the available summer days (this equates to 13 days/year), with wading the remainder of available days. Strain Ridge Road is somewhat less desirable as a play or recreational area; therefore, it is assumed that full-body exposure would occur at this location only as the result of accidental submersion (2 days/year), with wading the remainder of available days. Revised receptor-specific dermal surface areas are calculated below:

Country Club and Fluckmill Roads: (13,120 cm^2 x 13/68 days) + (2,559 cm^2 x 55/68 days) = 4,578 cm^2

Strain Ridge Road: (13,120 cm^2 x 2/30 days) + (2,559 cm^2 x 28/30 days) = 3,263 cm^2

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[4] For Country Club Road:
Adults = (2 days * 18,150 cm^2 + 66 days * 3,595 cm^2)/68 days = 4,023 cm^2
Youths = (2 days* 13,120 cm^2 + 66 days * 2,559 cm^2)/68 days = 2,870 cm^2
Child = (2 days *6,560 cm^2 + 66 days * 2,075 cm^2)/68 days = 2,207 cm^2

For Fluckmill/Strain Ridge:
Adults = (2 days * 18,150 cm^2 + 28 days * 3,595 cm^2)/30 days = 4,565 cm^2
Youths = (2 days * 13,120 cm^2+ 28 days * 2559 cm^2)/30 days = 3,263 cm^2
Child = (2 days * 6,560 cm^2 +28 days * 2075 cm^2)/30 days = 2,374 cm^2

Adult

At Country Club and Fluckmill Roads, it is assumed that adults have full-body exposure on 10 percent of the available summer days (5 days/year) as the result of play and recreational activities and accidental submersion. At Strain Ridge Road, it is assumed that adults have full-body exposure as the result of accidental exposure (2 days/year). Exposure at all three locations through wading is assumed to occur on the remaining available days. Revised receptor-specific dermal surface areas are calculated below:

Country Club and Fluckmill Roads: (18,150 cm^2 x 5/68 days) + (3,595 cm^2 x 63/68 days) = 4,665 cm^2

Strain Ridge Road: (18,150 cm^2 x 2/30 days) + (3,595 cm^2 x 28/30) = 4,565 cm^2

Comment 69: Sediment Contact - Like the water contact pathways, the sediment contact pathways are not important pathways in terms of their contribution to total risks. However, it is still important to note that these risk estimates have also been substantially overstated. This is because the analysis uses a very high exposure frequency of 68 days/year (as discussed in the preceding comments for the surface water pathways); an inflated sediment ingestion rate that is not supported by the EPA guidance upon which it is purportedly based; and an unreasonably high dermal adherence factor for youths and young children.

Response: Consistent with EPA's response related to surface water exposure frequency, EPA will continue to employ an exposure frequency of 68 days/year to evaluate Quarry Springs and upper Clear Creek (as represented by the Country Club and Fluckmill Road reaches). However, EPA acknowledges that lower Clear Creek (as represented by the Strain Ridge Road reach) is more remote and less accessible than upper Clear Creek. The HHRA calculations will be revised to employ an exposure frequency of 30 days/year for sediment exposures in lower Clear Creek.

Comment 70: Sediment Ingestion Rate - The HHRA uses a sediment ingestion rate of 100 mg/day for adults and 200 mg/day for youths, citing as support the soil ingestion rates provided in EPA's 1997 Exposure Factors Handbook. That guidance does not, however, support the use of these rates for these age groups. In fact, EPA (1997) presents an average rate for adults and older children of 50 mg/day and makes clear that mouthing behaviors, and thus soil ingestion rates, decrease substantially by the age of six, so that the age group of youths (7 to 18 years) is better represented by adult soil ingestion rates. Thus CBS believes that the rates for youth recreationalists should be the same as the rates used for adults.

While EPA (1997) does not provide any information about potential ingestion of sediment, and does not provide an upper bound estimate of adult and older child soil ingestion rates, EPA risk assessments often estimate that the upper bound rate is roughly twice the central tendency rate, as is demonstrated in the recommended soil ingestion rates for young children (EPA, 1997). If this same ratio were applied to the potential rate of sediment ingestion, it would result in an upper bound rate of 100 mg/day. This is the

same as the upper bound sediment ingestion rate that was used in the Housatonic River risk assessment (EPA, 2005).

Response: EPA acknowledges that as a group, the sediment ingestion rate for youths (7 to 18 years) may be better represented by the rates used for adult, rather than the rates for younger children. Therefore, the risk assessment was revised to use a sediment ingestion rate of 100 mg/kg for youths (7 to 18 years).

Comment 71: Sediment Adherence Factor - EPA has used a different soil adherence factor for adults than it has used for youths and young children. The adherence factor of 0.3 mg/cm^2 is based on upper bound exposure for an adult gardener while the value of 3.3 mg/cm^2 used for young children and youths is reportedly based on soil adherence for children playing in loose wet soil. There is, in fact, no reason to believe that sediment adherence for adults will be different from sediment adherence for youths as the sediment will have the same tendency to be washed off of the skin of youths and children as it will for the skin of adults.

The soil adherence value used to estimate skin adherence for children playing in sediment is not appropriate because the majority of sediment that contacts the skin will also be washed off by the water. In addition, children playing in an artificially provided loose, wet soil, which is the basis for the adherence factor of 3.3 mg/cm^2 used for children and youths, is not a reasonable surrogate for individuals who are wading in the creek where sediments and bank soils are more compacted and water will scour the skin as the individual moves around. Rather CBS suggests that the adherence factors reported by EPA (2004) for reed gatherers provides a better estimate of the amount of sediment likely to be adhered to the skin of individuals who are wading in the creek.

The recent risk assessment conducted by EPA for the Housatonic River in Massachusetts evaluated potential dermal contact with sediment for children aged 7 through 18 years and adults. In that assessment, EPA used the soil adherence factor of 0.3 mg/cm^2, based on average contact by reed gatherers. This is the same value that has been used in the HHRA for adults and appears to be reasonable, given that there is no reason to believe that more sediment will adhere to the skin of youths and young children than will adhere to the skin of adults during the same types of activities.

Response: EPA agrees that there is no reason to believe that the amount of sediment adhering to the skin of youths (7 to 18 years) and children (1 to 6 years) will be greater than the amount of sediment that will adhere to the skin of adults. Therefore, the risk assessment was revised to use an adherence factor of 0.3 mg/cm^2 for adults, youths (7 to 18 years), and children (1 to 6 years).

Comment 72: Soil Contact - The risks due to soil contact are also overestimated due, in part, to the extremely conservative exposure frequency and soil ingestion rate estimates that have been used to derive them. Frequency of exposure to soil is assumed to be even higher than potential exposure to surface water and sediment (76 days per year). In addition, as for sediments, the soil ingestion rates for older children have been substantially overestimated. Furthermore, the soil ingestion and dermal contact rates do

not reflect the fact that the total areas contacted during a day of exposure are likely to be a combination of contaminated and non-contaminated areas. Finally, the skin surface area exposed is assumed to be head, hands, forearms and lower legs for all age groups throughout the year.

Exposure Frequency

The HHRA uses an exposure frequency of 76 days for the soil contact pathways. This is based on EPA's professional judgment and assumes that individuals will be in contact with Site-related soils 4 days/week throughout June, July, and August, and 4 days/month for six additional months of the year. Such a high frequency may be reasonable in areas where the Creek runs adjacent to residential areas, such as the Country Club Road area, but is not reasonable for Quarry Springs, which is a less desirable area, or for the Fluckmill Road and Strain Ridge Road areas, which are more remote and to which access is substantially limited.

As discussed for the surface water pathway, it would be more reasonable to assume that individuals are present in these more remote areas 1 day per week on average during the warmer months of the year for a total of 30 days/year. CBS recommends that the risk evaluation be modified to be more site-specific for the individual reaches and use 30 days/year as a soil exposure frequency, except for the Country Club Road area.

Response: The Quarry Springs area is located near a residential area. As a result, receptors (adults, youths, and children) may frequent Quarry Springs based primarily on its convenient location. Therefore, an exposure frequency of 76 days/year will be retained for the Quarry Springs area. EPA disagrees with CBS's claim that the Fluckmill Road reach is sufficiently remote and inaccessible to require a reduction in exposure frequency. As noted in Table 2 in the HHRA, both children and adults have been observed fishing from the bridge and railroad structures in the area. Also, the road itself provides access to much of this reach. Based on this, an exposure frequency of 76 days/year will be retained for the Fluckmill Road reach. Therefore, an exposure frequency of 76 days/year will be retained for upper Clear Creek (as represented by the Country Club and Fluckmill Road reaches).

On the other hand, EPA acknowledges lower Clear Creek (as represented by the Strain Ridge Road reach) is relatively remote and that access to this area is more limited than for upper Clear Creek. Therefore, the risk assessment will be revised to reduce soil exposure frequencies along lower Clear Creek (as represented by the Strain Ridge Road reach) by 50 percent to 38 days/year.

Comment 73: Soil Ingestion Rate - As discussed under the Sediment Exposure pathway, the soil ingestion rates used for youths (200 and 100 mg/day for RME and CTE exposures, respectively) are not supported by the soil ingestion literature. According to that literature and EPA guidance (EPA, 1997), by the time an individual reaches the age of six years, his/her soil ingestion rate is decreased substantially and is more similar to adult rates of ingestion. Thus, for youth recreationalists, it is more appropriate to use the same conservative rates that have been used to evaluate potential adult exposures.

Response: EPA acknowledges that as a group, the soil ingestion rate for youths (7 to 18 years) may be better represented by the rates used for adult, rather than the rates for younger children. Therefore, the risk assessment was revised to use a soil ingestion rate of 100 mg/kg for youths (7 to 18 years).

Comment 74: Fraction Contaminated - The evaluation of exposure due to surface soil, bank soil, and floodplain soil contact assumes that 100 percent of the soil ingested and contacted on a daily basis will be contaminated soil. In fact, soils from the contaminated areas are likely to represent a very small fraction of the total incidental soil ingested daily, which will include a majority of soils from non-contaminated areas (i.e., away from the banks and outside of flood plain areas). As a result, it is not reasonable to assume that 100 percent of the soils contacted on each day of exposure will be contaminated soil. Given the relatively small sizes of the floodplain areas and bank soil areas, it is reasonable to assume that no more than half of the soil contacted daily will be derived from contaminated areas. Thus CBS recommends that an additional factor of 50 percent be used in calculating potential exposures due to soil contact.

Response: EPA acknowledges that it is unlikely that all of the soil contacted by receptors will be from site-contaminated areas. Therefore, all receptor-specific soil exposures was adjusted to incorporate a "fraction contaminated" factor of 50 percent.

Comment 75: Dermal Surface Area - The HHRA assumes that during all potential soil contact events, the hands, forearms, lower legs and head have contact with soils, even when the weather is inclement and individuals would be expected to wear long pants, socks, and long sleeved shirts. The justification for this is the possibility that some soil or dust could penetrate or get inside of clothing. While it is possible that a small amount of soil might work its way under pant or sleeve cuffs, it is highly unlikely that this soil will contact all skin areas assumed and will have the same level of adherence as will occur when skin is bare. Thus, CBS believes that it is necessary to adjust the dermal surface areas for soil contact to reflect lower contact rates when skin is covered by long sleeved shirts, long pants, and socks. In the HHRA for the Housatonic River in Massachusetts (2005), EPA made such an adjustment. For adult recreationalists, they adjusted skin surface areas for the colder months and derived a seasonally-weighted skin surface area of 4,446 cm^2. Similarly they derived seasonally-weighted skin surface area of 3,464 for 7 to 18-year old youths and 2,195 cm^2 for young children. It is recommended that these reduced skin surface areas be used to evaluate the soil contact pathway and provide more realistic estimates of exposure and risk.

Response: EPA acknowledges that the dermal surface area assumed to contact soil may be reduced during periods of colder weather when receptors are more likely to wear long-sleeved shirts, long pants, and socks. As noted in EPA's RAGS Part E, Supplemental Guidance for Dermal Risk Assessment (EPA 2004a) and in CBS's comment, weighting of dermal surface area may be appropriate for colder climates. However, noted in EPA (2004a) and again in CBS's comment, some studies have shown that dermal contact with soil can occur under clothing. Because of this, EPA does not consider the recommended dermal surface areas (as used in the HHRA) "to be overly conservative." Also, the receptor-specific dermal surface areas used in the HHRA range between 8 and 28 percent

higher than those proposed by CBS; these differences are relatively small and are unlikely to significantly impact risk and hazard results. Therefore, the receptor-specific dermal surface areas used in the risk assessment will not be revised.

Comment 76: Aggregate Exposures - Tables 8 and 9 of the HHRA provide summaries of aggregate risks and hazard indices, respectively. To calculate these, EPA has summed exposures from fish consumption, with contact with surface water, sediment, bank soil and floodplain soil to derive total risk estimates for RME low income, RME recreational, average low income and average recreational fish consumers at all four reaches. There are a number of problems with this approach that result in unrepresentative risk estimates and provide inaccurate information that can be extremely misleading for decision-making by risk managers.

First, these aggregate risk estimates assume that all individuals who have some contact with water, soil, or sediment are also fish consumers. In all cases, the risks associated with the fish consumption pathways have been combined with the risks associated with other direct contact pathways. It is not unreasonable to assume that individuals who fish from Clear Creek may have some contact with surface water or with soil/sediment in the area at which they fish. However, it is likely that the vast majority of individuals who may have contact with sediment or soil do not also consume fish from the Creek.

The HHRA states, in its defense of the evaluation of the fish consumption scenarios that are evaluated, that "it as [sic] assumed that at least one individual consuming fish at each of the considered fish tissue ingestion rates can be supported by the fish population at each location. Uncertainty remains regarding whether more than one individual can be supported by fish populations at each location. This uncertainty is expected to be moderate." Given this acknowledgement, it is possible that only one individual consumes fish from each reach of the Creek, particularly at the fish consumption rates used by EPA to estimate potential exposure. Thus, the aggregate risk estimates that are provided in Tables 8 and 9 may only be relevant for a single individual at each reach and are not likely to be representative of the recreational population as a whole. Risk managers may be misled by these aggregate risk estimates into assuming that the risks to individuals who use the Creek for recreational activities apply to a substantially larger population than is actually the case.

In addition, EPA has specifically developed aggregate risk estimates for the Quarry Springs area by combining the direct contact risk estimates with fish consumption risks based on the consumption of fish from Country Club Road, despite the admission that no fish consumption will occur from the Quarry Springs area. This is extremely misleading because it implies that risks associated with media concentrations at Quarry Springs are substantially greater than they actually are, since the vast majority of the estimated risks are based on the consumption of fish that are not even present in the Quarry Springs Area. This risk estimate could lead risk managers to make remedial decisions for the Quarry Springs area based on activities that will not occur there. As a result, if those risk estimates are used as the basis for remedial activities at Quarry Springs, the result will be no change in the ultimate risk estimates because remedial actions taken at Quarry Springs will not affect the

potential risks due to the consumption of fish from Country Club Road. Instead, any remedial decisions that are made for Quarry Springs should be based only on activities that could potentially occur in the Quarry Springs area. As acknowledged in the HHRA, these activities do not include the consumption of fish.

Finally, EPA's approach for aggregating potential risks and hazards double-counts (for Quarry Springs) and triple-counts actual direct contact exposures for the other reaches of Clear Creek that were evaluated. In evaluating the potential risks associated with sediments, bank soils, surface soils, and floodplain soils along different reaches of Clear Creek, EPA has considered each exposure pathway as a discrete exposure. Thus, for each evaluation, total daily soil ingestion rates and dermal contact rates have been combined with media-specific EPCs to estimate potential risks. While this is a conservative approach when considering a single medium, it is completely inappropriate to sum the estimated risks and hazards associated with multiple media because to do so, yields risk results that are completely unrepresentative of potential exposures in those areas.

For example, the HHRA has used an upper bound soil ingestion rate for adults of 100 mg/day, which is assumed to be a total daily soil ingestion rate. However, for Country Club Road, Fluckmill Road, and Strain Ridge Road, EPA has evaluated potential exposure due to the ingestion of sediment, bank soil, and floodplain soil separately, each using 100 mg/day as an ingestion rate, and then has summed these pathways to get an aggregate risk estimate. Thus, these aggregate risk estimates assume that individuals ingest 100 mg of sediment, 100 mg of bank soil, and 100 mg of floodplain soil on each day of exposure, for a total of 300 mg/day. This is not appropriate or characteristic of recreational exposures. Instead, if individuals have contact with sediment, floodplain soil, and bank soil on a given day of recreational activity, then using EPA's conservative rate of soil ingestion, these individuals will still only ingest a total of 100 mg/day but that total will be comprised of a combination of sediment, floodplain soil, and bank soil. In order to aggregate exposures for these pathways combined, the HHRA should either apportion the total soil ingestion rate among the different exposure pathways or should conduct a separate calculation that uses an EPC that is based on a combination of sampling data for all three media, weighted as is deemed appropriate. The same is true for the dermal pathway.

The same approach was used for the Quarry Springs area although only two duplicative media were evaluated (sediment and surface soil). However, the same approach as is described above should have been used to aggregate risks so that the ingestion and dermal exposure risks are not double-counted, as they currently are.

Response: EPA acknowledges that not all individuals who have contact with soil, sediment, and surface water will also consume fish from Clear Creek. The total (or aggregate) risks and hazards are intended to represent RME conditions. It is not unreasonable to assume individuals who have contact with soil, sediment, and surface water will also consume fish from Clear Creek. However, because the fish biomass at each receptor location may support only a small number (as low as one) of anglers at the assumed rate for each location, it is likely that the majority of receptors exposed in and

along Clear Creek do not consume fish at the assumed ingestion rates. Therefore, for the purpose of the revised HHRA calculations, two types of total risks and hazards were calculated: (1) all potential location-specific exposure pathways including fish ingestion and (2) all location-specific soil and sediment exposure pathways (excluding fish tissue ingestion). This revised approach provides risk managers with more accurate and clear information upon which to base their decisions.

EPA disagrees with CBS's comments regarding the decision to calculate total exposures, risks, and hazards for the Quarry Springs area by including results associated with potential ingestion of fish from Country Club Road. Clearly no fish ingestion takes place from the Quarry Springs area. However, it is not unreasonable to assume that individuals who are exposed to sediment and soil in the Quarry Springs area may also ingest fish from Clear Creek. Country Club Road represents the closest fish sampling location to the Quarry Springs area and for this reason was selected as the location at which individuals exposed to sediment and soil at the Quarry Springs area may reasonably be assumed to also be exposed through ingestion of fish. In light of the decision to calculate two types of total risks and hazards, any confusion regarding this approach should be minimized. The presentation of total risks and exposures based only on sediment and soil exposures at the Quarry Springs area will allow risk managers to make decisions based on this information alone if they choose to do so.

EPA recognizes that the approach used to calculate total receptor-specific exposures (or aggregate exposures) is conservative because it includes some double- or even triple-counting of potential exposure (such as assuming receptors ingest 100 mg/day of sediment, 100 mg/day of floodplain soil, and 100 mg/day of bank soil for a total of 300 mg/day). Therefore, for the purposes of the revised HHRA calculations, EPA calculated medium-specific exposures using the full medium-specific ingestion rate. This approach allowed medium-specific exposures to be evaluated on their own at each location. However, for the purposes of calculating total (or aggregate) exposures at the Quarry Springs area, EPA will assume that one-half of direct contact exposures (incidental ingestion and direct contact) is to soil and one-half is to sediment. Similarly, for the purposes of calculating total (or aggregate) exposures at Country Club Road, Fluckmill Road, and Strain Ridge Road, EPA assumed one-third of direct contact exposures is to floodplain soil, one-third is to bank soil, and one-third is to sediment.

Comment 77: Revised Risk Estimates - In an effort to demonstrate the degree of overestimation of the risk estimates provided in the HHRA, CBS has recalculated potential risks to these receptors using the recommended assumptions outlined and discussed above. The parameters and assumptions which were used to derive the revised risk estimates are briefly summarized below. These revised calculations are provided in detail in Attachment A and are summarized in Tables 1and 2.

Response: Because EPA does not agree with many of CBS's proposed parameter value revisions, review and comment on AMEC's revised risk estimates is not warranted. Also, for the purposes of this response, CBS's recalculated pathway-specific and aggregate risks and hazards as discussed in the preceding paragraph have not been repeated. However, EPA has recalculated potential risks to adult, youth, and child

receptors using the revised assumptions and parameter values discussed above in EPA's responses.

EPA's revised pathway-specific and total risk and hazard estimates are summarized in Tables 1 and 2 (See Attachment A), respectively, and are documented in Tables A1 through A5 in Attachment A. Specifically, Table A1 presents revised general and chemical-specific exposure parameter values, Table A2 presents medium-specific EPCs, Table A3 presents revised fish tissue risks and hazards, Table A4 presents revised surface water exposures, risks, and hazards, and Table A5 presents revised sediment and soil exposures, risks, and hazards.

Comment 78: Fish Consumption - CBS has recalculated the potential risks and hazards associated with the fish ingestion pathways, making the following changes:

- The analysis of consumption for subsistence consumers has been eliminated as there is no evidence that this type of behavior is occurring along Clear Creek.

- A fish ingestion rate of 1 g/day has been used to represent CTE exposures at all three reaches of Clear Creek. To evaluate RME exposures, rates of 1, 4, and 12 g/day have been used to evaluate the potential for fish consumption at Country Club Road, Fluckmill Road, and Strain Ridge Road, respectively. The rates of 1 and 4 g/day are based on the EPA (2000a) range for consumption from single, small waterbodies, and the rate of 12g/day is based on the 95th percentile rate reported by Ebert et al. (1993) for recreational anglers who consumed fish from rivers and streams.

- A new set of EPCs has been developed to represent potential exposure to a mixture of pelagic and benthic species (Combination fish). Given the low desirability of benthic fish for consumption and the reported high incidence of pelagic fish in Clear Creek, it has been assumed that 90 percent of the fish consumed from each reach are pelagic fish and that 10 percent of the fish consumed are benthic species. A weighted average fish tissue concentration has then been derived using the concentrations in pelagic and benthic fish that were reported in the HHRA for each reach.

- No TEQ risks have been calculated due to the lack of adequate data on TEQ in fish tissue and the uncertainties associated with the application of the approach.

Surface Water Exposure

CBS has revised the surface water exposure pathways to reflect more realistic potential for exposure at each reach, including the following changes:

- All of the reaches of Clear Creek that have been evaluated in the HHRA are too shallow for swimming so it has been assumed that swimming does not occur in any of those reaches. Instead, it is assumed that individuals could fall into the Country Club Road, Fluckmill Road, and Strain Ridge Road reaches of the creek

by accident, 2 times/year and ingest a limited amount of surface water during those events. Surface water ingestion is not evaluated for the Quarry Springs Area. No ingestion is expected to occur in the Quarry Springs area.

- During accidental falls, it is assumed the entire body surface area of each receptor is in contact with surface water.

- The exposure frequency for dermal contact in the Fluckmill Road and Strain Ridge Road reaches is assumed to be no more than 30 days/year due to their more remote locations and the lack of ready access.

- Dermal surface areas have been calculated for Fluckmill Road and Strain Ridge Road by assuming that the total body surface area is in contact with the surface water on 2 days/year and that wading occurs on the remaining 28 days of activity each year.

- For Quarry Springs it is assumed that exposure may occur 5 days/year but that only the feet will be in contact with surface water during those days.

- While the exposure frequency at Country Club Road is conservatively assumed to be 68 days/year, as presented in the HHRA, the dermal surface areas are calculated by assuming that there is full body contact with surface water during accidental falls on 2 days/year but that individuals only wade during the remaining 66 days.

- An exposure time of 1hour/day, to represent the time spent swimming. This factor is used to calculate the total surface water ingested during swimming as well as the factor "DA" for the dermal contact pathways. This exposure time is consistent with the exposure time associated with swimming events, as presented in EPA guidance (EPA, 1997).

Sediment Exposures

Sediment exposures have been recalculated using the same revised exposure frequencies as were used for surface water, due to the fact that sediments will be contacted at the same time that surface water is. Thus, the following revisions have been made:

- Exposure frequency of 68 days/year for Country Club Road but exposure frequencies of 30 days/year for Fluckmill and Strain Ridge Roads, and 5 days/year for Quarry Springs.

- A sediment adherence rate of 0.3 mg/cm^2 has been used for young children and youths to match the sediment adherence rate used for adults (based on reed gatherers) and reflect the different potential for adherence of sediment and soil.

- Upper bound sediment ingestion rate of 100 mg/day for adults and older children, based on EPA's (1997) discussion about soil ingestion by children over the age of 6 years.

Exposure to Soils

Many of the same changes have been made to the soil contact pathways. These changes have been applied to all of the soil contact calculations (floodplain soil, bank soil, surface soil) and include the following:

- A revised soil ingestion rate of 100 mg/day for youths has also been used.

- While the exposure frequency for Country Club Road is unchanged, due to the proximity of residences in the area, the exposure frequency for Fluckmill Road and Strain Ridge Road has been changed to 30 days/year and the exposure frequency for Quarry Springs has been reduced to 5 days/year to be consistent with the other scenarios and reflect site-specific characteristics.

- Revised skin surface areas have been calculated to reflect that fact that individuals will wear long sleeves, long pants, and socks on days in the early spring and late fall when the weather is cool.

In addition, CBS had added a factor for the fraction of soil contacted daily that is contaminated. That factor has been conservatively assumed to be 50 percent to reflect the fact that individuals will also spend at least half of their days in areas that are not contaminated.

Total Risks

Total aggregate risks have also been recalculated and are presented in Tables 1and 2. To calculate these risks, the following changes have been made:

- Aggregate risks for the Quarry Springs area have been revised to exclude the fish consumption pathway.

- Aggregate risks for Country Club Road, Fluckmill Road, and Strain Ridge Road include all of the exposure pathways but assume that 1/3 of the soil contacted is bank soil, 1/3 is floodplain soil, and 1/3 is sediment on every day of exposure.

- Aggregate risks for Quarry Springs include all of the direct contact pathways but assume that ½ of the soil contacted is surface soil and 1/2i s sediment on each day of exposure.

Results

Using these revised assumptions and parameters, CBS has recalculated pathway-specific and aggregate risks. As shown in Table 1 (See Attachment A), all cancer risks fall within or below EPA's acceptable risk range. As in the HHRA, these risk estimates are